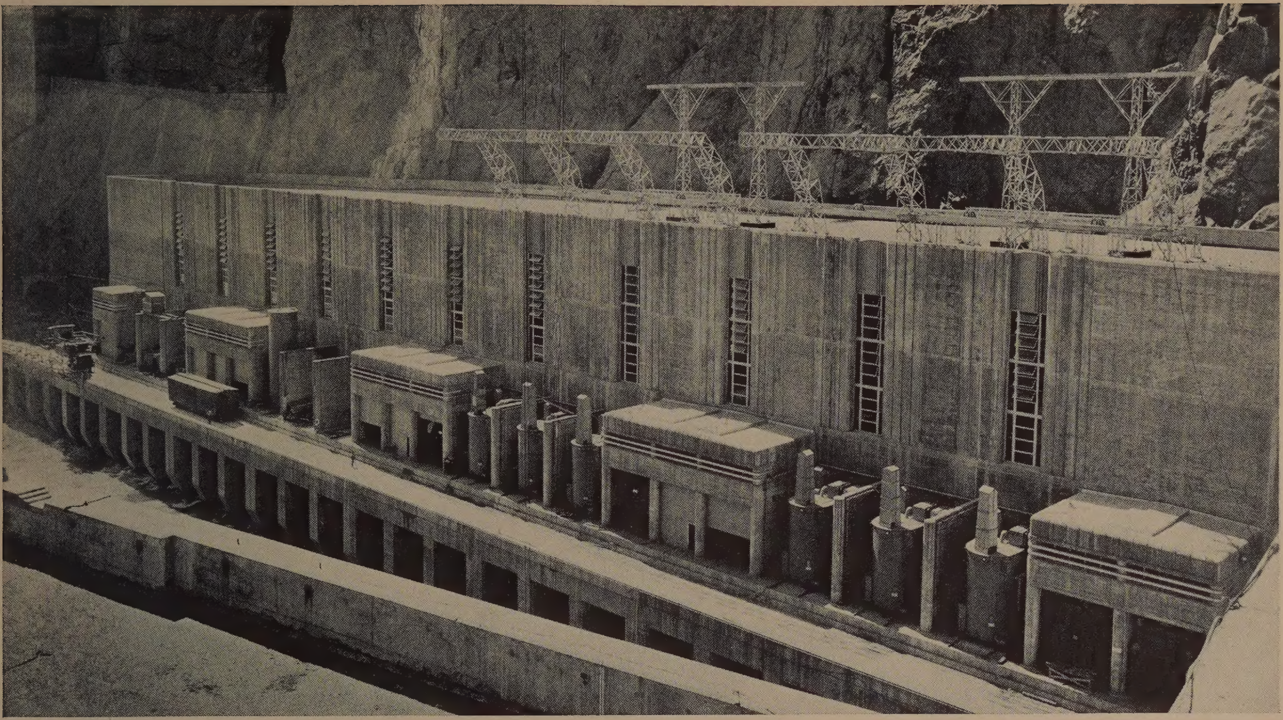
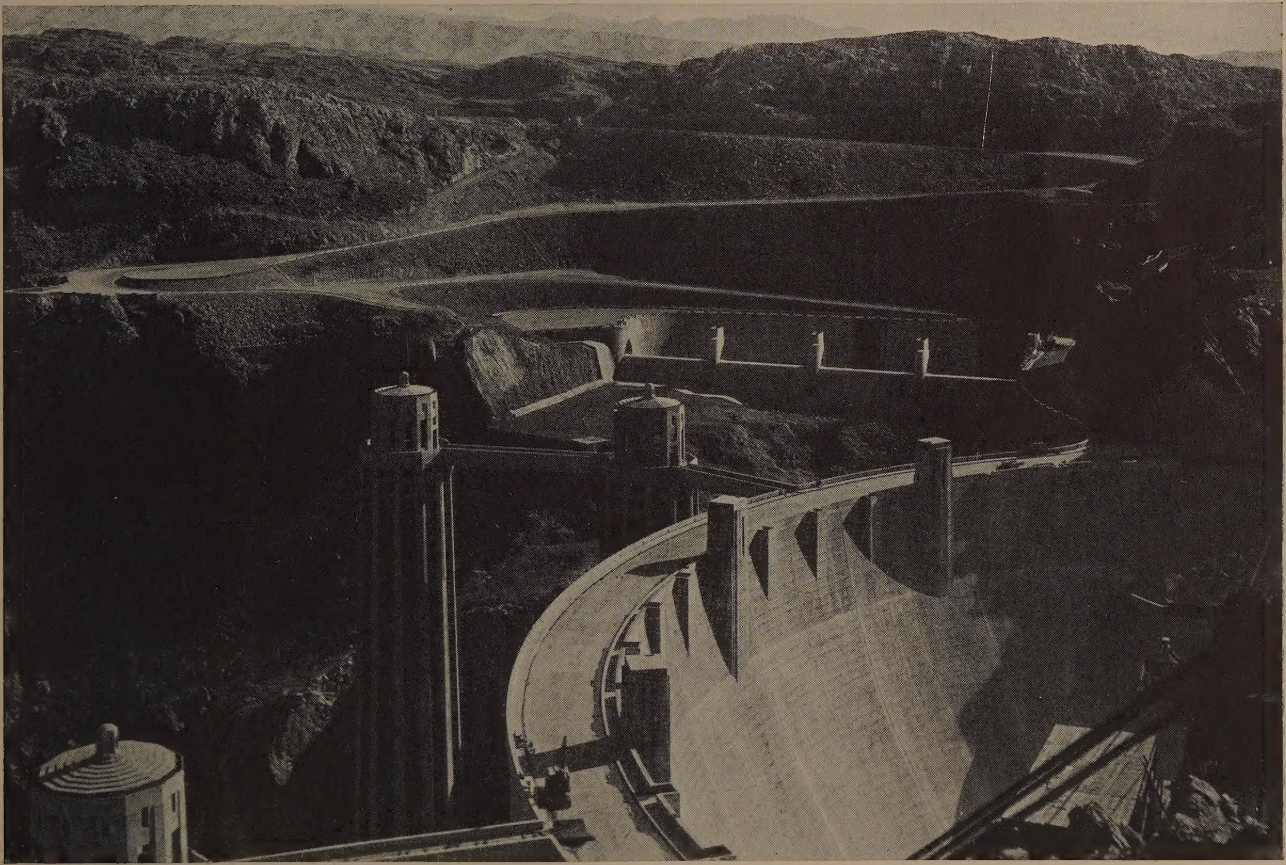


Fenestration punctuates at suitable intervals the rhythm created by the column spacing of the power house.



Towers and platforms, determined by functional and construction requirements, create an interesting play of shadows at the crest of Boulder Dam.

". . . an entirely independent design, classic in character," was evolved for Nemours Carillon Tower near Wilmington, Del. Massena and Du Pont, architects; Sauter and Schwertner, contractors.

Nemours Carillon Tower

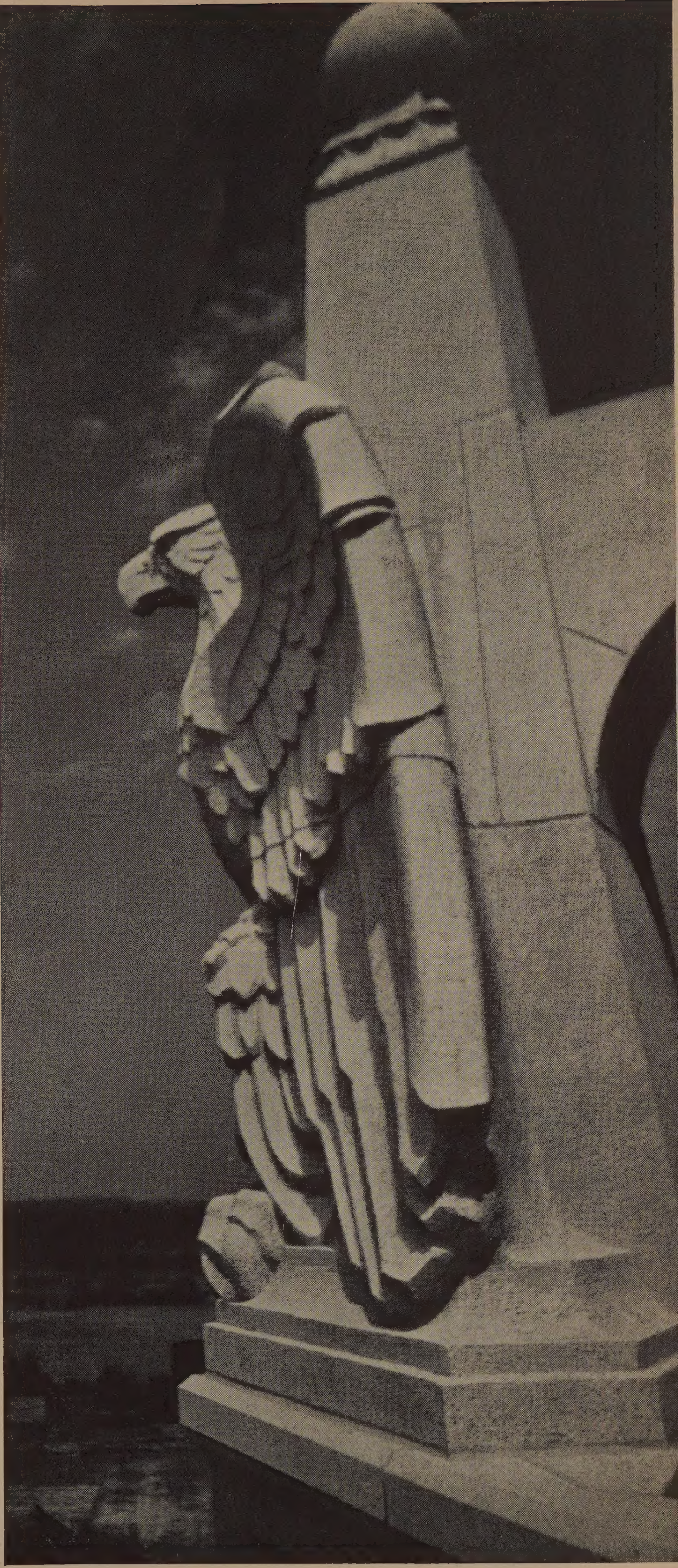
The Ideals Inspiring Its Architectural Design

By M. M. Du Pont

IN VOLUME I, No. 6, of ARCHITECTURAL CONCRETE there appeared an article describing certain methods employed in the construction of the Carillon Tower at Nemours, near Wilmington, Delaware. At the time that article was published, the tower was slightly more than one-half finished. It stands fully completed today, a new landmark, becoming more and more familiar to those who pass Wilmington frequently, whether they go by land, river or sky. Its slender height and the music of its bells so dominate the local scene that many inquiries have been made by travelers as to its origin.

This article will attempt a resumé of the ideas and inspiration embodied in its architectural design and will not go into a further discussion of the construction details involved in its actual building. The tower with its Carillon of 30 bells will be open to the public not many months hence, as soon as the surrounding grounds have been landscaped.

Readers of ARCHITECTURAL CONCRETE may feel that this subject sounds abstract and therefore consider this



At the observatory story are four heroic American eagles which, like the exterior of the shaft above the base, are of cast stone. The cast stone slabs served the double purpose of finish and forms for the monolithic concrete walls of the tower.

an unusual topic to be taken up here; but as a matter of fact, if it is conceded that "functionalism" means not only the use to which a building is put but also the definite ideals that underlay the preparation of its plans, then the Nemours Carillon Tower may be considered the essence of functionalism. So a study of the ideals governing its architectural design is therefore a study of tangible features used deliberately to delineate an idea.

This idea originated in the mind of the client who presented the architects with the problem of raising a memorial to his mother and father which would give pleasure to the public, through the music of chimes, and would at the same time contain crypts for family burial. Much study resulted in the decision that a campanile would express best the wishes of the builder. Because of various of its uses since ancient days, the tower has become associated in the human mind with protection, freedom and religious significance. Egyptians used towers for enormous harbor lights; in medieval days they were both lookout towers for the protection of the neighboring populace and bell towers to celebrate the ceremonies of the community; in the Far East they served the double purpose of commemoration and worship.

The tower, then, seemed eminently suitable for the client's purposes. The next step was to determine what architectural type would express the full idea. At first, studies were made of the spire of the church at Nemours in France where ancestors of the client had lived, and because, also, of the French inspiration of the existing buildings on the estate where the tower would be erected. This answer to the problem was found defective, however, for the French spire scarcely harmonized with the surroundings. Neither the architects nor client favored such a solution—one that has ruined so many well-intentioned artistic enterprises in America. For similar reasons sketches modernistic in feeling were soon discarded.

The crypts were designed to give a feeling of repose and dignity.

Avoiding a copy of any existing building, therefore, an entirely independent design, classic in character, was evolved. The result possesses an intrinsic originality and simplicity in itself which is in harmony with the existing architecture on the estate and with the spirit of the locale.

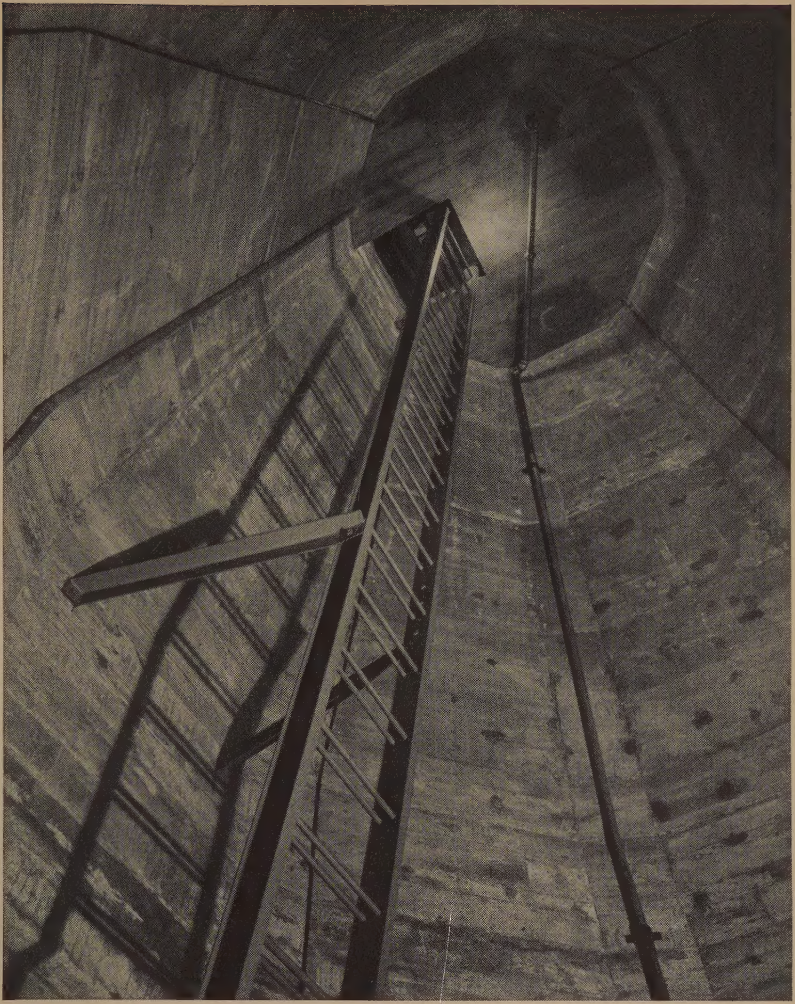
In a wide and sturdy square base of heavy native stone, with horizontal monoliths at the corners, four flights of steps, one on each side of the square, rise to a terrace 7 ft. above ground. From the center of this spacious terrace the shaft of the tower lifts itself up high to an octagonal belfry. This is crowned by a delicate spire with a cross at its summit, attesting to the client's religious sentiment in this project. So the idea is expressed of the strong roots of this symbolic tower growing in the native rock and of its height rising with the utmost simplicity of detail. Here, lights and shadows play on four heroic American eagles with their wings half open as if to fly. Architecturally they serve as a transition between the shaft and the more detailed superstructure. Above them swing the bells enclosed only by eight slim pilasters, each ending in an urn that bears the stone flame of classic significance. From them the final finger of the tower points into the sky.

The main shaft of the campanile, though square, has its corners chamfered and then emphasized by cast stone quoins so that the surmounting octagonal lantern story is not too contrasting. The transition is also softened by the continuing line of the eagles' wings and the buttresses which connect them to the cornice face of the upper stage. This main shaft is 8 in. wider at the bottom than it is immediately under the main cornice; also, the cornices on the arcades have a different projection than above the pilasters—this to avoid deformations due to perspective.

The decoration of the belfry stage of the tower follows certain structural requirements, for example: The eight arcades of the bell chamber have been kept as wide as possible to allow the sound of the chimes the fullest freedom and the bells themselves are hung in the uncrowded turret 160 ft. above the ground, which for their shape and size is the ideal height. This is an improvement on the conventional design of belfries prevailing in this country, where the bells are often crowded or hidden behind small louvers which destroy the full value of the sound, or are hung at the wrong height so that, if too high, the tones are wasted and thin and, if too low, conglomerate. The vertical lines of the Nemours Tower rise from flat country and this, too, is propitious for its bells which receive thus a wider area for their sound.

The U. S. Department of Commerce regulation making beacon lights a necessity on tall structures provided the architects with an opportunity to achieve an interesting effect of illumination for the Carillon Tower. This gives the tower its true meaning at night as well as in the daytime. While the chimes of this tower measure the hours, its beacons measure the days, for daily they are lighted a half hour before sunset and extinguished a half hour after sunrise.

The design and choice of material in the treatment of the crypts follow the keynote of strong simplicity expressed by the exterior of the tower. A visitor to the burial vaults in the foundations of the tower will receive not the gloomy impression that a memorial to the dead usually gives; but, following the wishes of the client, rather an effect of peaceful repose and dignity. Here the marble floor and marble walls with travertine pilasters have been treated so as to express their beauty directly, without any complicating applied decoration. The bright color of the Fiorello marble, the indirect lighting, thrown strongly on the vaulted ceiling (treated acoustically to avoid the usual resonance of an underground chamber), and electric heating as well as thorough ventilation which offset dampness, all combine to give the impression of restful beauty.



Monolithic concrete walls, exposed as they came from the forms, give a feeling of strength and elegance to the interior.

The entrance hall conforms to the general scheme of simplicity. Its marble walls reflect the concentrated light from a huge arched window where stained glass is to be placed. The final stained glass window will probably carry special historical interest for the visitor.

Because of the impression of slim height that this tower gives from the exterior, one is surprised at the feeling of spaciousness on visiting the interior. This feeling prevails in the crypts, in the entrance hall and even as one mounts to the music room and at any of the floor landings as well. Here the cast-in-place concrete, which with the granite and cast stone helps to make up the whole structure, takes on a special significance in itself. This is because none of these materials has been used as a veneer, either outside or in, but together through the forethought of the design, they are the component elements of the whole. And, more, the placed concrete, so long considered a marvelous aid to building but of little beauty in itself, achieves a sure value as an interior finish, where it has been left untouched. In a structure noted for the beauty of its exterior and the special features of its foyer and crypts, the placed concrete left as a finish in the upper stories presents an arresting strength and elegance of its own.

As the Carillon Tower at Nemours adds the dignity of age to its beauty and strength it will give rise undoubtedly, to legends and even perhaps to song, as have the famous towers of antiquity. Since early Christian days, bells have been accredited with special potency and were even consecrated with full baptismal ceremonies. One wonders what the future of the dedicated chimes of Nemours will be, as time passes. Will they, like the bells of Old Christ Church, Philadelphia, a gift to the pioneers from Queen Anne, be temporarily sunk in the river for safety's sake during wartime, as those were during the American Revolution, or, protected by their American eagles will these bells sound out in an unbroken sequence of days for as long as the granite substratum of rock exists, upon which this tower is built?

New Schools in Los Angeles

Scores of Buildings Planned Under New Program

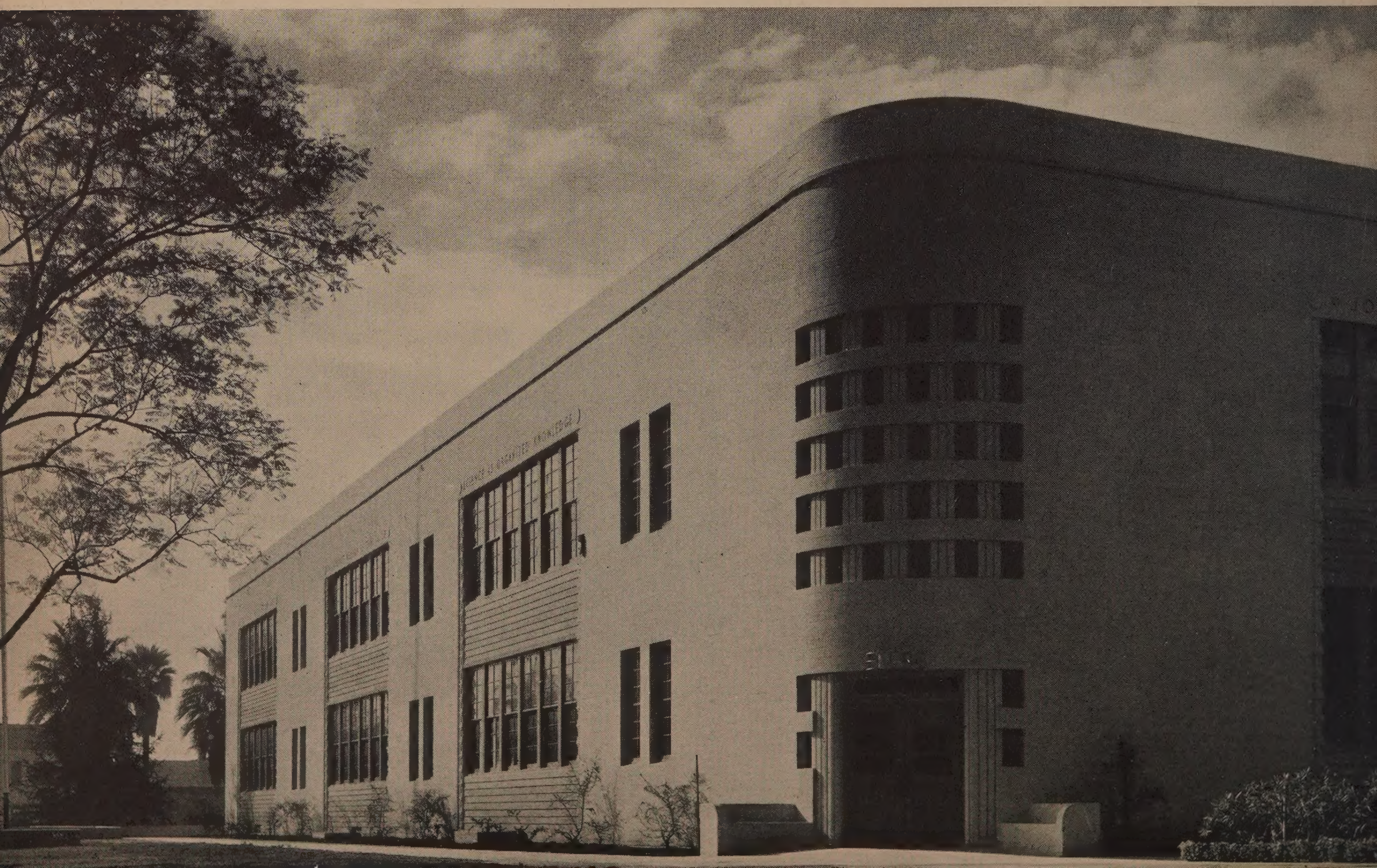
PROTECTION for thousands of school children and efforts to keep public property loss to a minimum in event of future earthquakes is one aim of the great state-wide school building program now in progress in California. This program, probably the largest in the history of school construction, calls for rehabilitation or replacement of practically every school building in the state. Already $40,000,000 has been allocated for these projects by the Public Works Administration—a sum which has been augmented by building funds raised by school districts.

Behind this huge program is the disastrous earthquake of 1933 of which the greatest destructive force was centered in the Los Angeles area. In the days following these tremors residents of the affected areas counted their losses in wrecked and damaged buildings, and parents speculated on the fate of scores of children had the quakes struck during school hours. The result was state-wide agitation for quake-proof schools.

Shortly thereafter the state legislature met to pass, on the recommendation of architects and engineers, new laws controlling the design and construction of buildings of all types. Particular attention was given to higher standards for school construction, and the rehabilitation of old schools was ordered to meet these new standards as rapidly as possible. Provisions made mandatory in these codes were, for the most part, new to school construction practice. The laws emphasized careful consideration of lateral forces in design, a factor not given much importance previously. This provision made it necessary to use rigid exterior and cross walls.

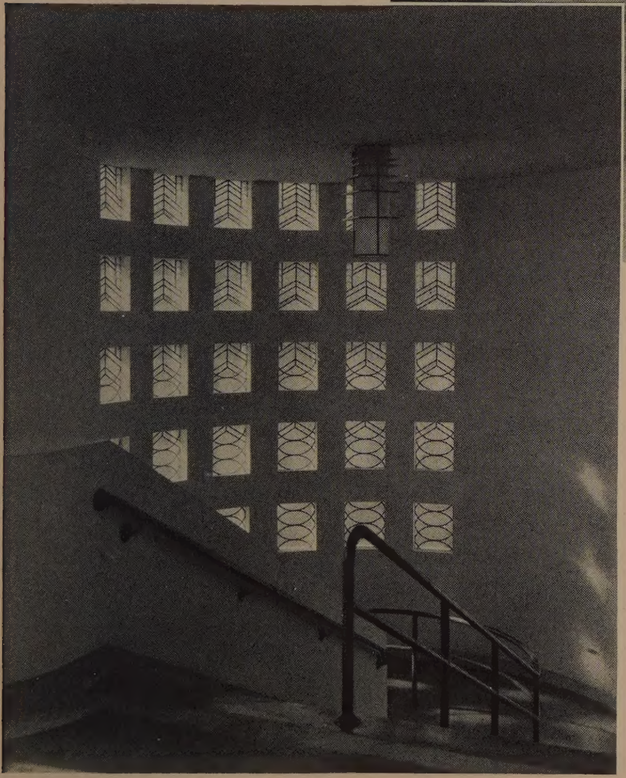
The Field Act passed by the 1933 legislature, which is the statute requiring earthquake-resistant construction in school buildings, is being rigidly enforced by the State Division of Architecture. The Division, faced with the enormous task of checking the scores of plans filed for new school construction and rehabilitation, has worked diligently to expedite the completion of the various programs throughout the state and the efficiency of its work will assure high grade,

Science Building of Hollywood High School, one of the many new schools in the Los Angeles district. Marsh, Smith and Powell, architects; R. H. Annin, supervising engineer; Sarver and Zoss, contractors—all of Los Angeles.



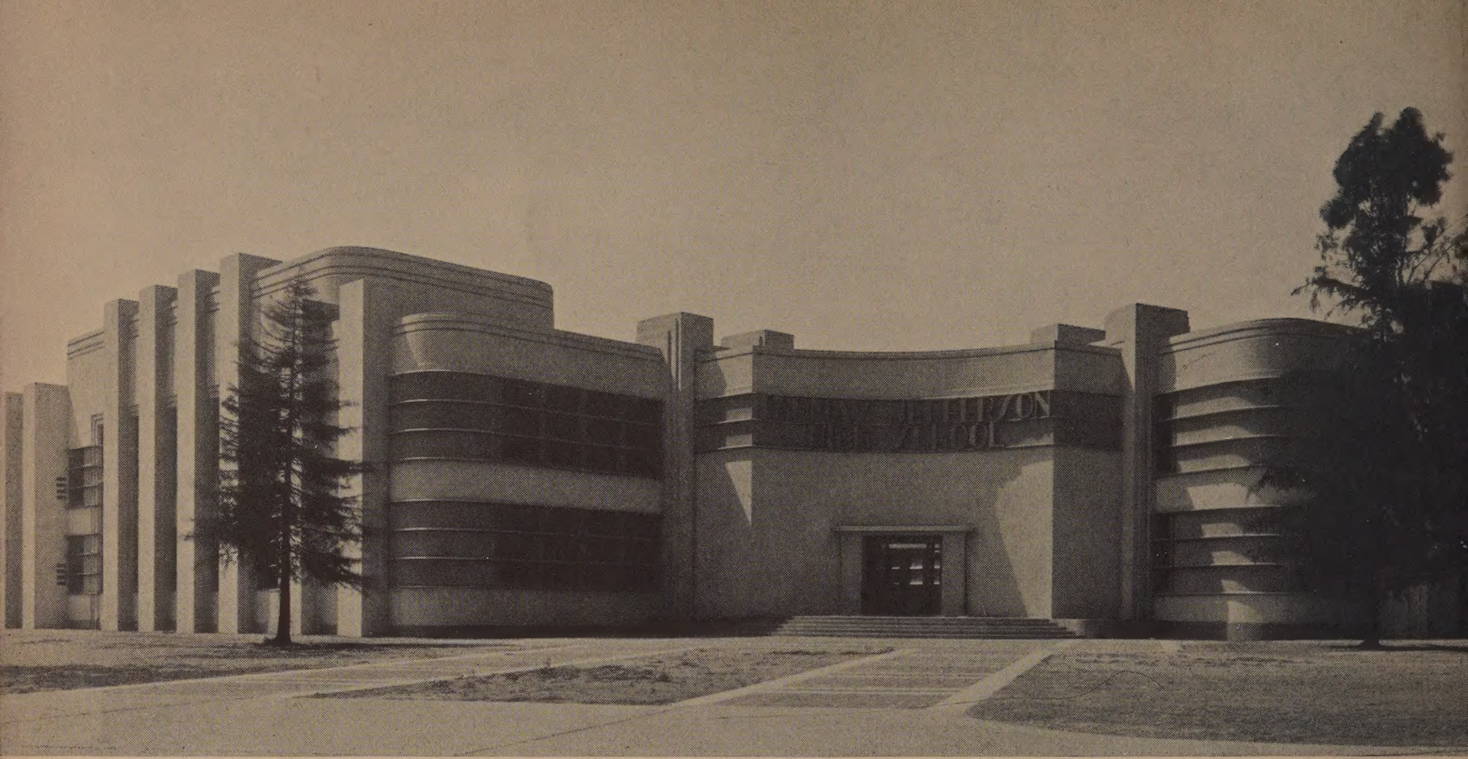
Curving surfaces and an interesting grouping of intersecting planes are combined to form the charming, modern design of Hollywood High. The doorway lintel was cast in a plaster waste mold and tooled. The grille was cast in place.

Below—an interesting transition from curves to straight lines in the leaded glass of the grille.

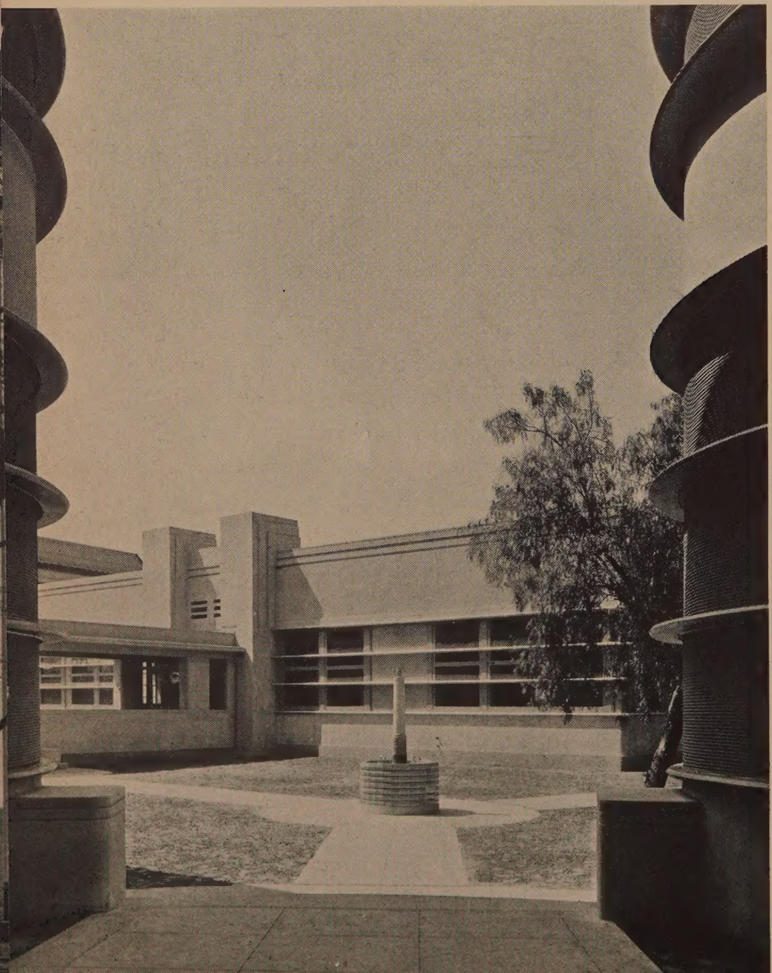


safe construction even in the smallest project.

Since all of the state schools could not be immediately rebuilt, the situation in Los Angeles and Long Beach, where many damaged schools had been demolished and others were found in need of extensive repairs, was given first consideration. In the Los Angeles school district alone more than 471 buildings were marked for replacement or rehabilitation at costs estimated in excess of $34,000,000. The 1934-35 program, just completed, was carried on at an expenditure of $11,706,336. The program for 1936-37, well under way at this time, calls for expenditures of at least $22,532,000. Since the total valuation of schools in the Los Angeles school district is $77,000,000, this $34,238,336



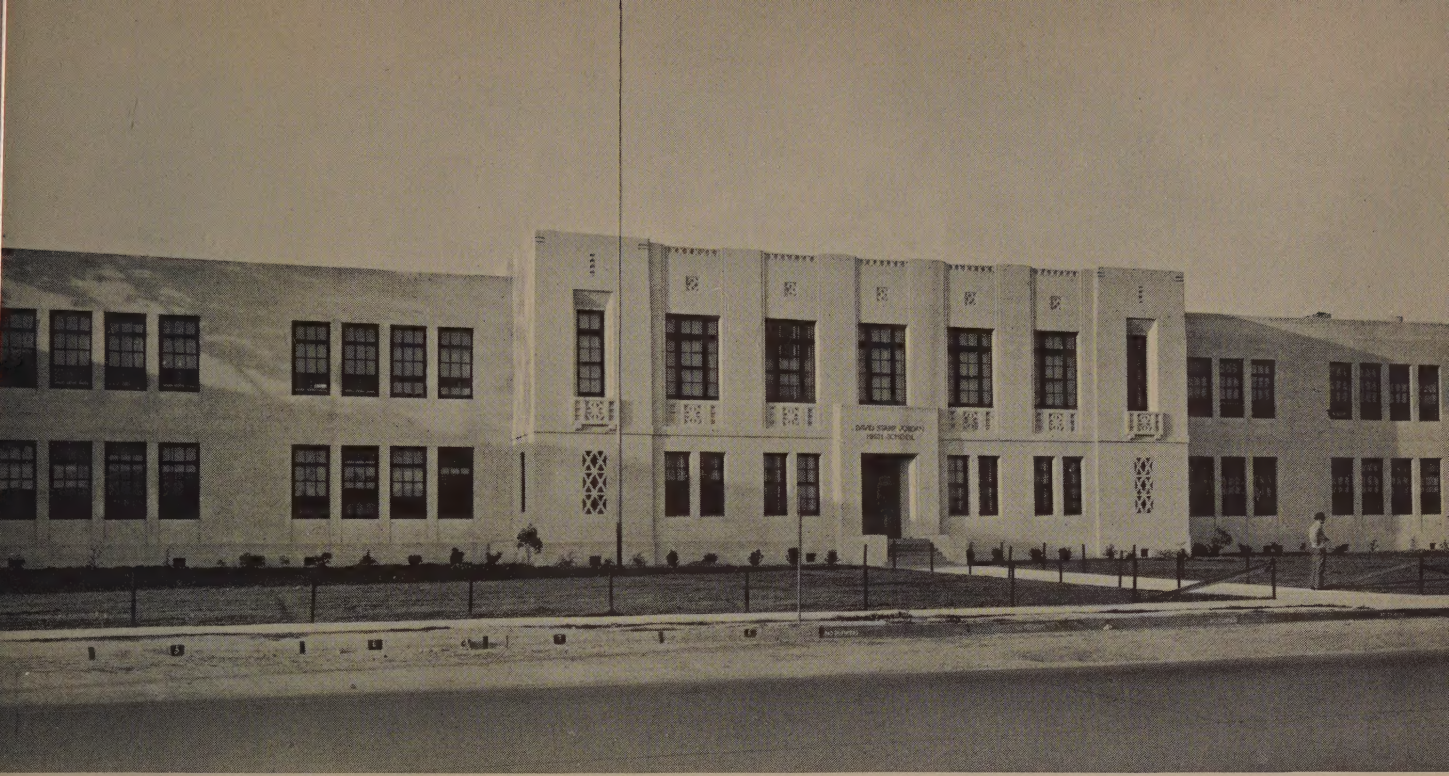
A strong modern feeling is expressed in the design of Thomas Jefferson High School, Los Angeles. Strong pilasters and horizontal metal fins across the continuous windows and corrugated cement plaster curved corners are the only ornamental detail. The building is so orientated that almost every elevation derives direct sunlight sometime during the day. Morgan, Walls and Clements, architects; S. B. Barnes, consulting structural engineer; Weymouth-Crowell Construction Co., contractor.



expenditure for rehabilitation amounts to about 44½ per cent of the total valuation.

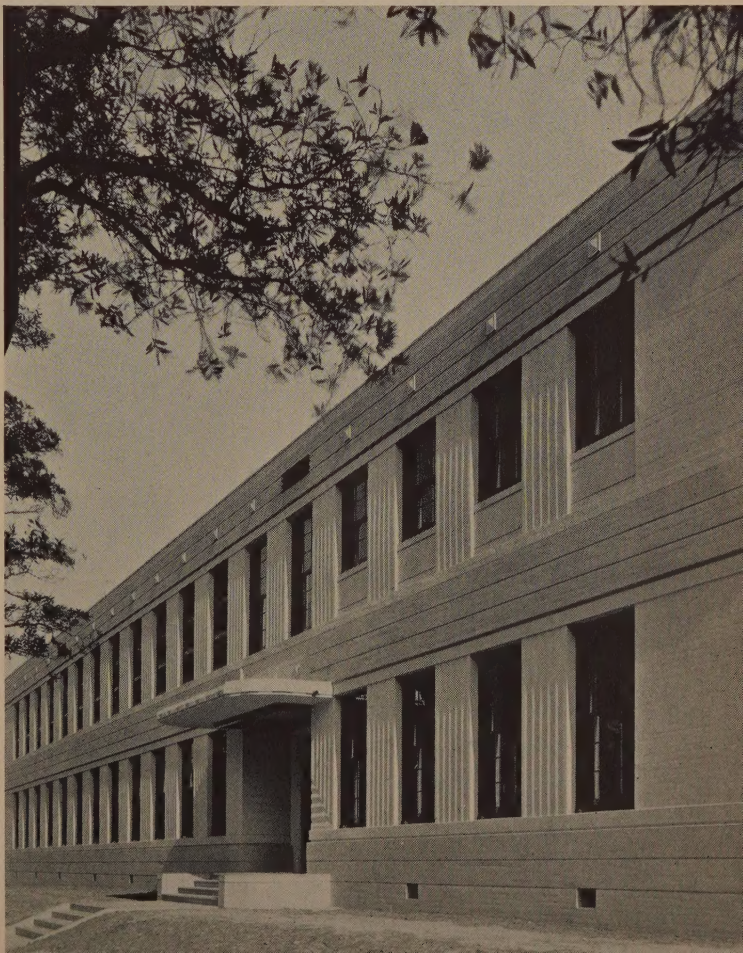
The current program provides for 257 building units including 15 complete new plants. In addition to replacements and reconstruction of buildings, four other items are included in the new program—construction of retaining walls, painting, land purchase and construction of school tunnels. Protection against erosion by construction of retaining walls is provided at 32 schools. The heavy, rapid traffic on Los Angeles boulevards creates a serious hazard to children. This accounts for the construction of 16 additional school tunnels.

PROJECT	Elem. Schools	Junior High Schools	Senior High Schools	Junior College	Admin. Bldgs.	Total	
						Schools	Bldgs.
New Buildings .	12	5	19	1	1	38	46
New Plants . . .	5	7	3	....	....	15	....
Rehabilitations	56	4	4	....	....	64	74
Replacements .	57	5	9	1	....	72	79
Retaining Walls and Grading	24	3	5	....	....	32	....
Painting	80	6	20	1	....	107	190
Land Purchases	47	9	8	....	....	64	....
School Tunnels	15	1	....	....	....	16	....



David Starr Jordan High School was built at a cost of $132,180—23.9 cents per cu. ft. This splendid concrete structure was designed by Sumner Hunt. William Mellema was structural engineer and Easton and Nesser, contractors.

Form marks are emphasized on the surfaces of newly-built Lafayette Junior High, erected at a total cost of $118,676. The cube cost was 28.9 cents. Parkinson and Parkinson, architects; J. G. Middleton, engineer; Theodore A. Beyer Corp., contractor.

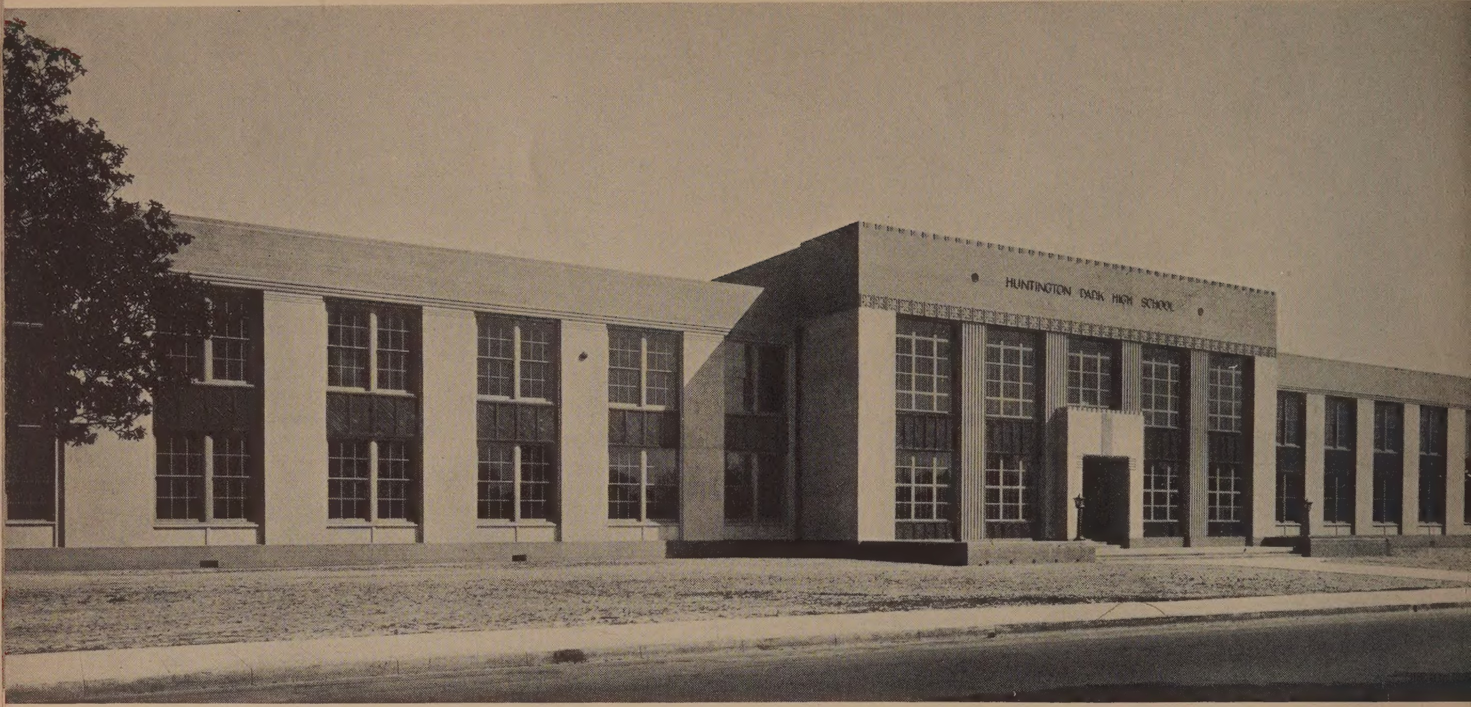


Projects included in the application for federal grants and loans to carry out this work are shown in the accompanying table.

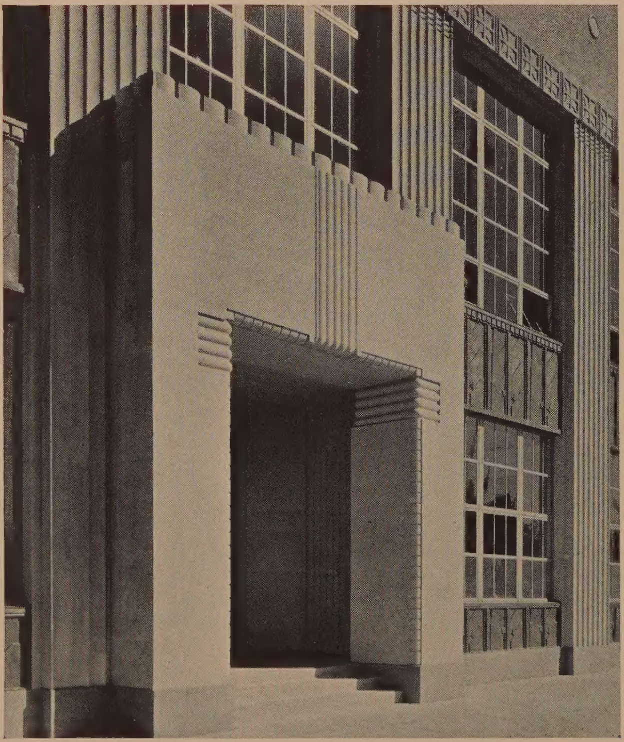
To carry on this gigantic work, leading California architects and engineers were engaged, and under their direction a new form of school architecture is emerging. Old structures of the popular and more or less elaborate Spanish type have lost much of their applied ornamentation in remodeling. This is due to general agreement that falling ornaments are an added hazard of earthquakes. Like most of the new buildings, these older schools have been reconstructed with reinforced concrete with smooth white or buff walls to harmonize with California sunlight and scenery.

In the future many school children will be protected by the solid concrete walls of the new schools now under construction. Where surface ornament is required, it is placed monolithically with the walls in molds. Wooden floors have practically disappeared, and in the few instances where they have been used they are braced by steel or concrete frames which tie side walls together. With quake-proof construction a large measure of firesafety has been built into these new schools.

A rather new engineering feature of these buildings is the



Two shades of portland cement paint were used in finishing Huntington Park High School. Simply designed with large window areas, decorative detail is confined to wood and waste mold formed patterns about the main entrance. Designed by George M. Lindsay with Paul Jeffers as structural engineer and Harvey Nichols, contractor; the school was erected for $156,625.



The sharp, clean-cut, molded detail is due to properly constructed forms and complete control of concrete mixes.

general use of slip joints. These joints, placed between wings or connected sections of large buildings, permit individual units to move independently of other units having different periods of vibration without damaging the structure. Previous use of joints has been confined to structures wherein volume changes due to moisture content or temperature might induce unusual stresses.

Modern styles in architecture, which might have come rather slowly to California schools, have been widely adopted for most of these new buildings. The need for simple, well integrated designs which could be executed with the greatest economy, is largely responsible for this choice of architecture although the esthetic results are highly pleasing.

Aside from the scores of attractive new buildings which are replacing old structures in Los Angeles, this community is reaping another advantage from this school construction program. It is the first opportunity for large scale application of new ideals in educational planning. The weight of strong rigid walls has been reduced by generous fenestration in all the new schools. Free from the necessity of rebuilding according to old forms, these schools are planned and arranged to provide rooms for special uses. In some cases, particularly adaptable to Los Angeles climate, partially or completely open air class rooms have become a part of the school plan.

Although the threat of tragedy was the forerunner of Los Angeles' new school system, this building program will have the happy result of placing the city's educational facilities on a level if not in advance of any to be found elsewhere in the world. It has provided a splendid opportunity for architects and engineers to apply modern ideas in education and construction to the use of modern, economical building materials. It will be a model for school construction and planning for many years to come and an important proving ground for the principles of modern education.

Some Cost Data from L. A. School Building Program

LOS ANGELES' extensive school building program, under which many similar projects are being designed and constructed simultaneously, has provided a splendid opportunity for the study of construction costs. An important aspect of these studies is the development of basic information on the relative costs of labor, material and services which should be of value to designers and builders in making future cost estimates. One of the most interesting relative cost breakdowns was that prepared when application was made for federal grants and loans for the current $22,532,000 program. A summary of individual project estimates combined to show the division of monies, is reproduced below. The resulting percentages of building money required for each phase of the work reflect a general but quite accurate picture of the relative costs of the average school job.

APPLICATION TO F. E. A. OF PUBLIC WORKS LOAN AND GRANT OF $22,532,000

Elementary District	$11,416,000
High School District	10,469,000
Junior College District	647,000
	$22,532,000

Division of Allotment:	Amount	Per Cent of Total Altmt.	Daily Average Number to Be Employed
(a) Labor (on projects):			
1. Unskilled	$ 2,199,421	9.76	1,400
2. Intermediate	1,571,015	6.97	1,000
3. Skilled	3,848,987	17.08	2,450
4. Technical and Clerical	235,652	1.04	150
	$ 7,855,075	34.85	5,000
(b) Superintendent	$ 474,800	2.13	125
(c) Professional:			
1. Architects and Engineers	$ 1,296,500	5.75	800
2. Costs of Architectural Division of School District	613,400	2.72	100
	$ 1,909,900	8.47	900
(d) Other Expenses on Project:			
1. Material, Supplies and Equipment	$ 9,646,675	42.81	10,000
2. Contingent	488,250	2.17	[incl. in (a)]
3. Land, Right-of-ways, etc	2,043,000	9.06	10
4. Preliminary Expense	69,300	.31	20
5. Miscellaneous Costs	45,000	.20	20
	$12,292,225	54.55	10,050
(e) TOTAL	$22,532,000	100.00	16,075

Estimated expenditure per man year of employment $2,621.11 @ 130 hours per month at an average wage of $0.855 per hour.
Estimated total man hours 9,792,600 hours on actual construction.
Estimated time from beginning to completion—18 months.

Ratio of Labor Cost to Material Cost	1.169 to 1
Ratio of Total Contract Cost to Labor Cost	2.335 to 1
Average wage of labor per hour	$0.855
Contractor's cost (including Labor and Material) per man hour	1.6802
School District's cost per man hour	1.9981
Contractor's cost per man year (including Labor and Material)	2,621.11
School District's cost per man year (including Labor and Material)	3,117.16

Design for shop building of William McKinley Junior High. Witmer and Watson, architects and Paul Jeffers, structural engineer. This well-lighted concrete structure which frankly reveals its function will cost about $40,000.

The relative costs of labor and material of the construction operations and mechanical services on a typical school project are shown in the following example. The breakdown of costs of construction is for a new 2-story concrete class room building costing approximately $130,000.

NEW TWO-STORY SCHOOL

	Percentage
Excavation and Trucking	1
Concrete	18½
Carpentry (including Forms and Rough and Finished Woodwork)	19
Steel, Iron and Reinforcing Steel	22
Hardware	3
Sheet Metal and Roofing	2
Painting	3
Glass and Glazing	1
Marble and Tile	2½
Lath and Plaster	8
Plumbing	2½
Heating and Ventilating	4½
Electric Work	3½
Blackboards	1
Linoleum	3
Electric Fixtures	1½
Window Shades	½
Insurance	2
Bonds	1½
	100%

In the above table the plumbing, heating, ventilating and electrical contract percentages are low because the mechanical plant was not in this particular building. The average for these trades for a complete plant would be 15 to 20 per cent. In that case the other percentages would be somewhat lower.

Of great interest in these days of modernization is the following breakdown of construction costs on an $80,000 rehabilitation job. This is a typical project in which 4-in. brick walls are replaced with a 4-in. wall of Gunite and reinforced concrete cross walls are introduced to strengthen the structure against earthquake forces.

REHABILITATION WORK

	Percentage
Demolition and Trucking	8
Concrete and Gunite	25
Carpentry (including Forms and Rough and Finished Woodwork)	8
Steel, Iron and Reinforcing Steel	30
Hardware	1
Sheet Metal and Roofing	2
Painting	3
Marble and Tile	1
Lath and Plaster	5½
Plumbing	2½
Heating and Ventilating	2
Blackboards	1
Linoleum and Cork	1
Electric Work	4
Insurance on Labor	3
Bonds	1½
Miscellaneous	1½
	100%

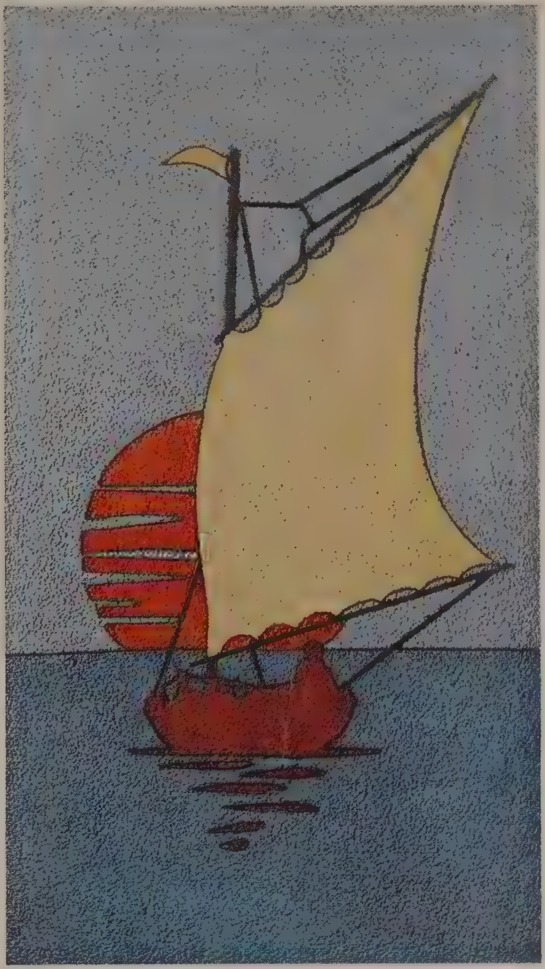
Project for auditorium of new Western District High School. The entire plant is estimated to cost $500,000, the auditorium, $105,000. H. L. Gogerty and C. E. Noerenbergh, architect and engineer.

MANUFACTURED COLORED AGGREGATE FOR ARCHITECTURAL CONCRETE

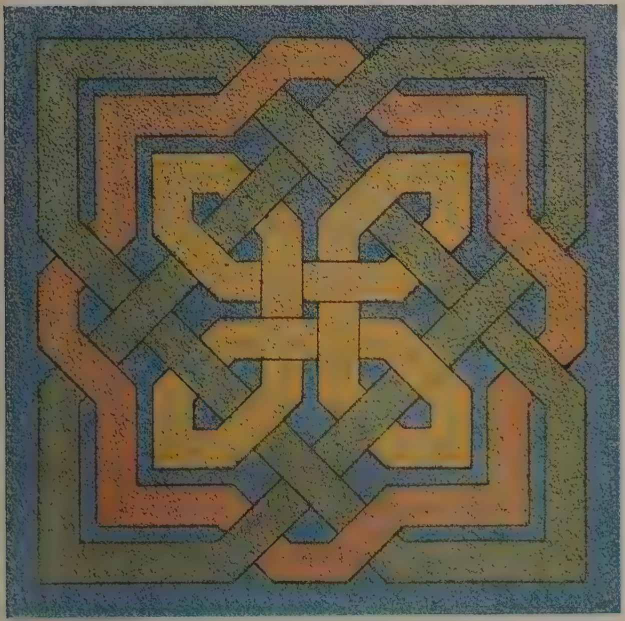
THE production of integrally colored (not painted or stained) concrete has been very largely limited in the past to the use of natural aggregates, principally the marbles and granites, and to coloring the cement paste with mineral pigments. The range of colors has therefore been restricted to hues of relatively low value because the more brilliant colors could not be produced by either of these methods. Limited amounts of quite expensive manufactured aggregates used in a few notable examples and with a special technique indicated, however, the possibilities of producing in concrete permanent colors in hues and values unattainable with natural materials. Laboratory research and investigation of sources of manufactured materials suitable for concrete aggregate have resulted in making commercially available highly colored aggregates within a price range economically feasible.

Permanency of color is of primary importance for any decoration in which color is to be used. In manufactured aggregates the color is a product of the integral fusion or vitrification of coloring components with a stable base and is as unchangeable as it is in mosaic tile, fine porcelain or cathedral glass. It is this permanently colored aggregate that gives lasting brilliant color to architectural concrete through a technique which produces a surface which is composed almost entirely of aggregate particles.

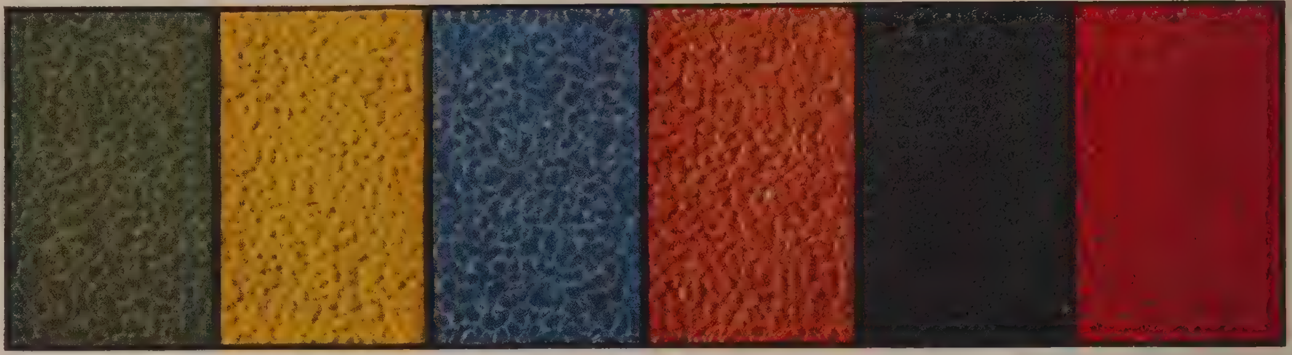
Manufactured colored aggregates are of two types which for purposes of differentiation may be referred to as ceramic and vitreous. The ceramic aggregate is made from high grade clays and other ceramic raw material by processes similar to those used in producing pottery and china ware. The vitreous aggregates are made with materials and by


Direct color reproduction One-fifth scale

An illustration of pictorial type of decoration produced with manufactured colored aggregate in designs outlined by metal stripping. By combining the aggregates shown on the following pages practically any color desired can be produced since the small spots of color contributed by the aggregate particles blend into one another when viewed from a short distance.


Direct color reproduction One-seventh scale

Geometrical and conventional patterns of almost any degree of intricacy or simplicity are readily produced in cast stone using colored aggregate concrete placed between metal strips and molded face side down. Other methods of separating the colors, some of which are illustrated, may be used where an outlining of metal is not desired.



Direct color reproduction

One-half scale

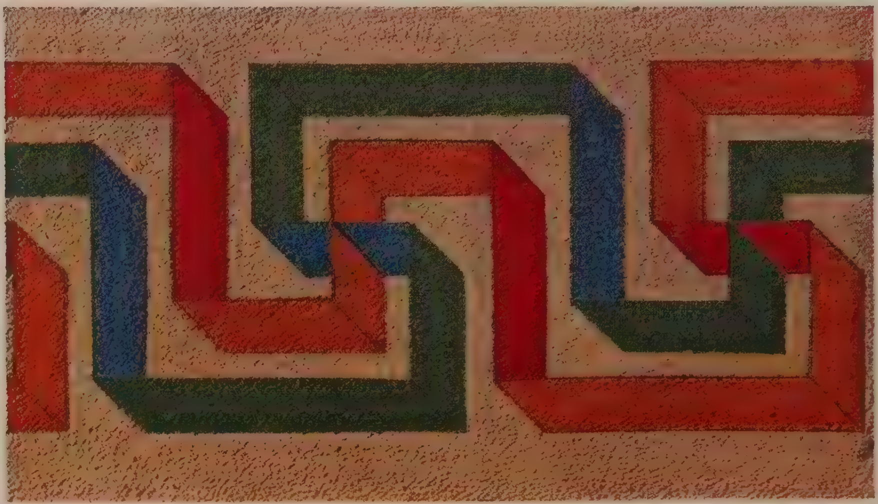
A group of colored aggregate concrete panels showing six of the colors of manufactured vitreous aggregate tentatively adopted as standard. This material is characterized by greater brilliance and luster than the ceramic aggregate shown on the facing page.

methods similar to those used in producing porcelain frits or glass. While the colors of ceramic aggregate are bright and clear, they are characteristically soft. Vitreous aggregates are distinguished by their luster and brilliance. Certain colors can be produced only in the vitreous type of aggregate. In making these colored aggregates commercially available, manufacturers have for purposes of convenience and economy set up as tentative standards colors which were already in production. While it is possible to produce any shade of color in these materials, users will probably find it more practical to stay within the range of colors set up as standard or which can be produced by mixing the standard colors. Ceramic and vitreous materials used as aggregates in portland cement concrete are made in accordance with carefully established specifications. Materials not made for concrete aggregate should not be used.

A thoroughly practical technique has been developed for using these colored aggregates in architectural concrete through the medium of cast stone. From the standpoint of design, this material may be conceived as a mosaic in which aggregate particles are substituted for the usual tesserae and set en masse through the medium of cast stone instead of singly. The principles underlying this class of work are outlined here for the guidance of architects and designers who may desire to make use of this material and a few examples of such work are included to show its possibilities. These examples are simply experimental specimens intended to illustrate methods and to suggest ideas to resourceful designers. They are not presented as anything but examples to study and are themselves secondary to the ideas and principles they illustrate.

The economic practicability of producing brilliantly colored cast stone by means of manufactured aggregate requires that the aggregate be used as a facing which is as thin as is consistent with sound concrete practice. From the standpoint of manufacturing technique, ¼ to ⅜ in. appears to be about the minimum practical thickness. To some extent this is a question of the relative cost of the additional aggregate which would be required for a greater thickness and the cost of the extra care necessary in making cast stone with thin facings. From the standpoint of physical quality, tests and actual performance have amply demonstrated that in the hands of experienced manufacturers relatively thin facings may be successfully used on cast stone without risk of separation or structural weakness.

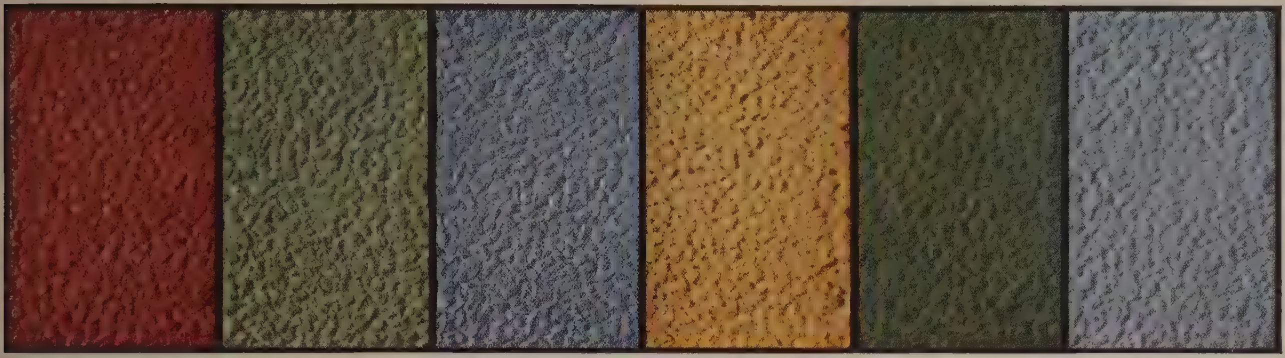
The production of cast stone colored by means of special



Direct color reproduction

One-fifth scale

Example of running ornament made with a combination of ceramic and vitreous aggregates showing how the effect of relief may be produced on flat surfaces through the use of color. Metal strips were used in this panel to separate the colors.



Direct color reproduction

One-half scale

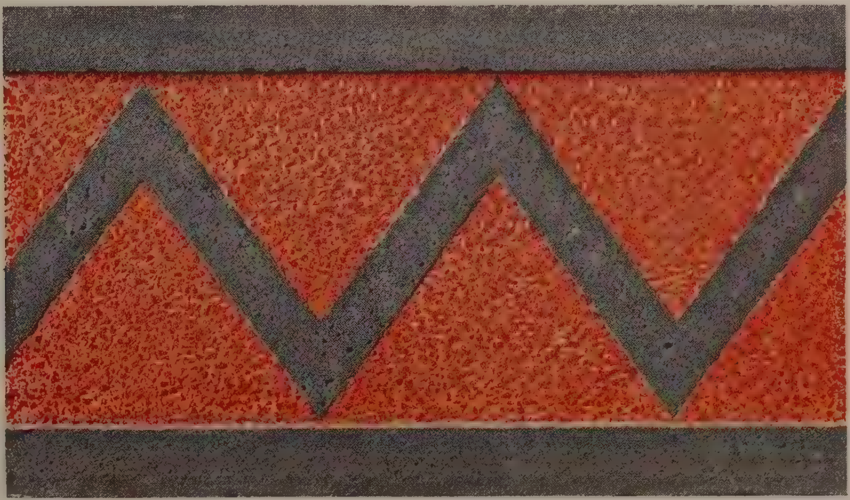
Six of the eight colors of manufactured ceramic aggregate tentatively adopted as standard for use in colored aggregate cast stone and concrete are shown in this group of panels. The durability of material of this type and the permanency of its color are well established by the long history of porcelain materials.

aggregate is not limited to any particular method of manufacture. For best results, however, the surface of the units must show more aggregate than is customarily the case with cast stone produced by methods other than vibration. Adjustments in mixes and aggregate grading as outlined below can be made by an experienced manufacturer so as to obtain a satisfactory appearance irrespective of the particular molding process used.

The finish which may be regarded as characteristic of work done with manufactured colored aggregate is one in which the aggregate particles are exposed by brushing off the outer coating of cement before the concrete has thoroughly hardened and before being cured. This type of finish produces a surface composed of many-faceted particles which from any angle reflect the true color of the material. Rubbed, honed and polished finishes may be given to cast stone made with this aggregate but, due to its extreme hardness, such finishes are likely to be rather expensive. Moreover, rubbing leaves the particles with only one face exposed and tends to dim the luster and brightness of the natural facets. A fairly smooth finish which approximates a coarse sand-rubbing can be produced by cleaning the surface with a type of brush which exposes the aggregate without digging out between the particles.

The texture and roughness of the finished surface can be varied through the size of the aggregate particles and the depth to which they are exposed by brushing. In no event should the depth of the brushing be greater than one-half the diameter of the predominating particles. Uniformity in the distribution of the aggregate in the surface and in its exposure helps to prevent an appearance of roughness.

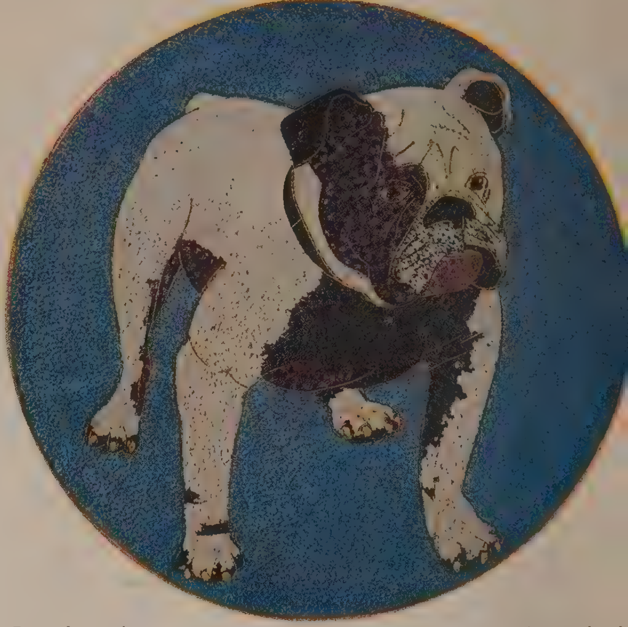
The choice of texture and hence the size of the aggregate for a particular job depend upon the nature of the work itself and the distance from which it would ordinarily be viewed. From a distance of 15 to 20 ft., a surface made up of aggregate particles $\frac{3}{8}$ in. in diameter and brushed out $\frac{1}{8}$ to $\frac{3}{16}$ in. will appear smooth. For work to be seen at close range or which has a pattern in small detail, aggregate as small as $\frac{1}{16}$ in. in diameter may be used or the brushing may be much lighter with only the thin outer coating of cement being removed. It will be found that the larger sized particles will give a greater percentage of aggregate showing in the finished surface, and therefore greater intensity of color. Even for ornamentation in relief a fairly coarse aggregate may be used and exposed by brushing without damage to moderately fine detail.



An illustration of one method of using manufactured colored aggregate as inlay. The triangular areas were recesses molded into the surface of the cast stone made with ordinary aggregates. Subsequently the recesses were filled by hand with colored aggregate concrete. The aggregate was exposed by brushing off the surface film of cement before it had hardened.

Direct color reproduction

One-fifth scale



Direct color reproduction One-seventh scale

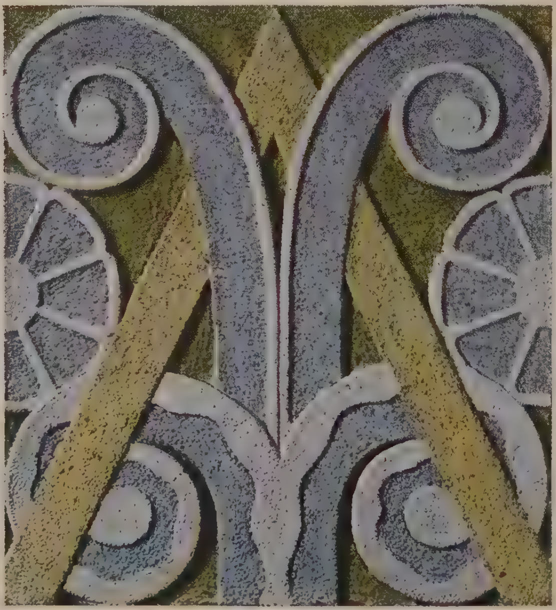
By varying the proportions of the colored aggregates, almost any desired gradation of color can be produced. In this specimen, for example, small amounts of red and blue aggregates are combined with white to shade the light areas of the figure.

The strength of color in cast stone made with colored aggregate depends largely upon the extent to which the exposed surface is composed of aggregate particles. A coverage of 80 per cent or more is readily obtainable and it has been found that 80 per cent is about the minimum which will give satisfactory results. In this connection, grading of the aggregate is of extreme importance. Experience has shown that a grading in which particles of one size predominate, with intermediate sizes between the coarser and the finer material left out entirely, produces maximum density of aggregate on the surface. This principle of "jump" grading was established in experiments conducted by Prof. Robert H. McNeilly, which were described in Engineering News-Record, November 27, 1915, and has since become the basis of this type of exposed aggregate work. In this connection also, it is extremely important that the aggregate particles be rounded or cubical in shape. Such particles not only assist in obtaining a dense, uniform texture but their shape assures maximum embedment.

Opinion varies as to the necessity for and the benefit of incorporating color pigment in the cement used with colored aggregate. Personal tastes and the requirements of the job itself must be depended upon to settle this question. It is possible to obtain close to the full benefit of the colored aggregate without the inclusion of pigment in the cement, particularly in work that is to be viewed at a distance.

The execution of designs and patterns in color in cast stone requires a means of preventing the mixtures from intermingling while they are being placed in the mold. On flat work this can be accomplished: (1) by the use of metal stripping such as is used in terrazzo; (2) by thin strips of wood or composition which are subsequently removed and the groove pointed with a colored mortar; (3) by small ribs or fins on the face of plaster molds which leave a small *V* depression between adjacent areas of color; (4) by molding recesses in the face of the cast stone and afterwards inlaying the various colored mixtures. On work carrying relief, the depressions of the mold itself provide separation for the colors.

The introduction of color into concrete and cast stone by means of colored aggregate in place of pigments minimizes the importance and effect of efflorescence which is common to most masonry materials. It is no less necessary, however, to follow practices which will still further reduce the likelihood of trouble from this source. In this type of exposed aggregate finish, the normal procedure of curing before finishing is reversed with the result that salts released in the hydration of the cement may be deposited on the finished surface when the unit dries. For this reason it is highly desirable to see that the cast stone is allowed to dry thoroughly after it is cured and that it is then cleaned with an acid solution in order to leave the surface clean and bright. In some cases a second treatment may be required. It is preferable to have the cleaning completed before the cast stone is set. If time or circumstances do not permit this or if efflorescence reappears after the cast stone is in place, cleaning may be done on the job. An efflorescent deposit usually weathers off naturally within a short time. It does not occur unless moisture gets into the wall and carries efflorescent producing salts to the surface. Tight joints are the best precaution against such an occurence after cast stone is set.



Direct color reproduction One-seventh scale

Cast stone panels with ornamentation in relief, such as shown, are executed in color by placing the various colored aggregate concrete mixtures in a plaster mold. The depressions in the mold separate the colors.

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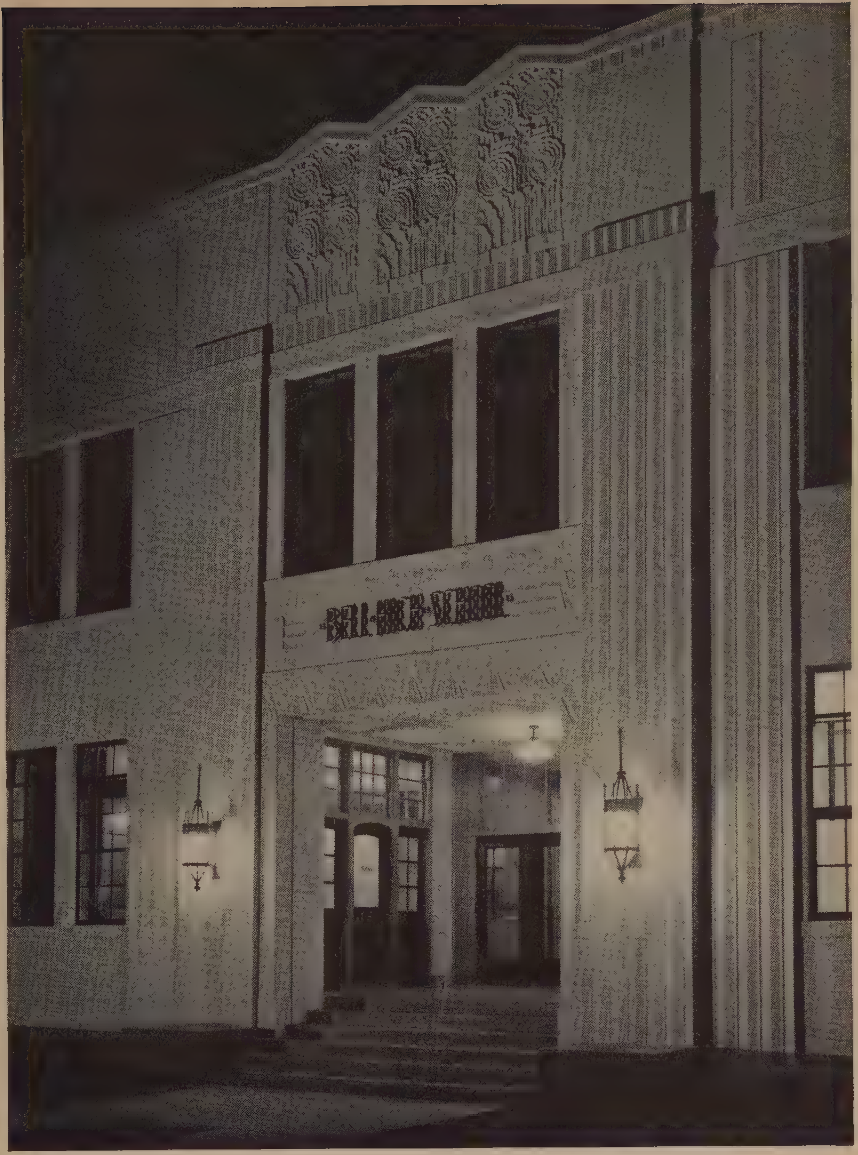


Entrance to rebuilt Bell High School, Bell, Calif. Train and Cressy, architects; Oliver G. Bowen, consulting engineer; Pearson and Thiele, contractors.

Bell High School Reconstruction

By Robert F. Train, Architect

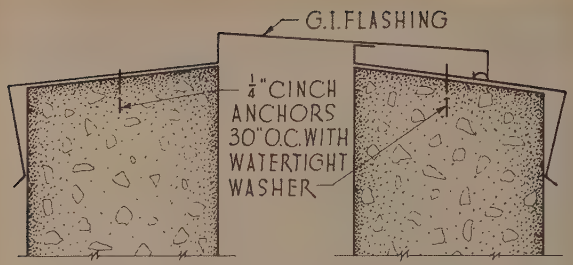
SINCE Bell High School at Bell, Calif., was a rehabilitation project, the chief concern of the architects was to provide structural safety and maximum utility. The architectural design of the exterior, limited to a large extent by the plan of the previous structure, was therefore of secondary consideration. As it stands, the new Bell High claims no particular architectural style unless it could be said that it is a modern adaptation of Renaissance. The classification of its architecture, however, is a relatively unimportant factor.

Problems of design and construction involved adapting the foundation of the old building to a new and modern superstructure. The old foundation was changed only where necessary to conform to the requirements for earthquake resistance. Above ground old masonry walls were replaced with reinforced concrete. The low bearing power of the soil, the greater weight of ordinary concrete compared with the old masonry walls and the provision of the Field Act making it necessary to consider the added load on the foundation due to earthquake forces required careful study. The result is revealed in the engineering design, the architecture and unusual construction features of the new building.

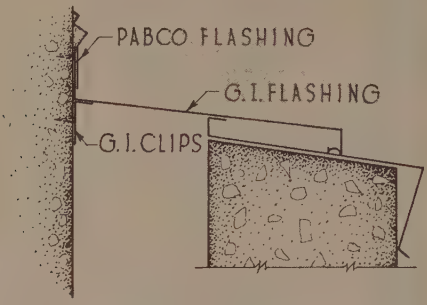
As the plan indicates, Bell High comprises five different sections with class rooms in Units 1, 2, 4 and 5 located on either side of Unit 3, the central portion of the building. The administration offices and auditorium are located in this section. The auditorium, seating approximately 1,300 at present, has a large stage and scenery loft. Provision is made for future construction of a balcony. Elsewhere in the building are spaces devoted to cafeteria and library use.

Efforts to give greater interest to the exterior which was predetermined by the rather conventional plan of the old building were confined principally to balancing of the broad window areas and special treatment of the concrete surfaces. Since the general design permitted only a moderate use of molded ornament around the entrances and on the coping, all decorative details are essentially simple.

The fluted pilasters on either side of the entrances, other entrance trim and the coping detail were cast in wood molds. Other more intricate ornament such as the large panels above the entrance were formed in plaster waste molds. Great care was observed in specifying the forms for the plain surfaces which, it may be noted, have continuous V-shaped projections at the joints. These plain surfaces were formed with 6-in. boarding, carefully aligned to assure neat, uniform appearance. The joint spacing was definitely established, and, when necessary, board widths were graduated to avoid using narrow boards and odd spacing. The V-shaped bead was produced by chamfering



PARAPET GAP FLASHING DETAIL

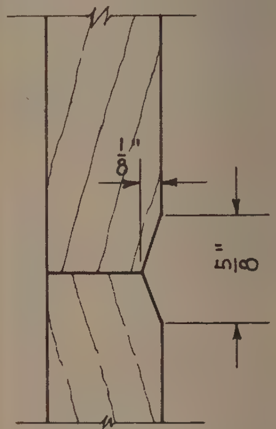


PARAPET FLASHING AT SLIP JOINT

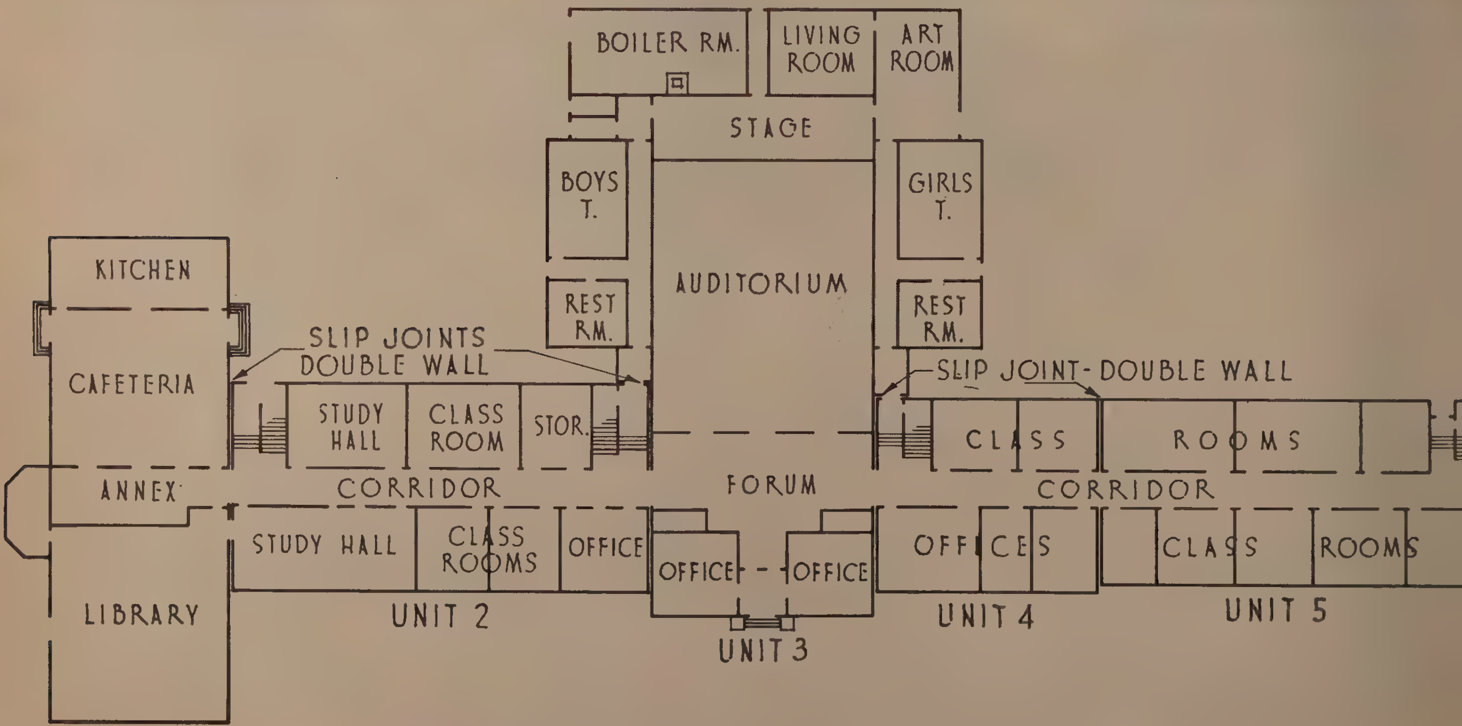
the face edges of the form boards about ⅛ in. as indicated by the accompanying sketch. The result is a pleasing pattern of horizontal shadow lines running around the building. Where smoother surfaces were desired, as in the entrance trim, 5-ply Douglas fir panel-board was used after proper oiling for form sheathing.

Very little retouching was found necessary when the forms were stripped. Two different colors of portland cement paint were used on the exterior: the shaded areas brown while the balance of the building, or field, is a light buff. This combination of color tones provides interesting contrasts on the walls and serves to emphasize the dominant structural and architectural details.

The replacement of the old masonry walls with reinforced concrete and provisions for earthquake resistance produced interesting problems in structural design and construction methods. An important feature of the structural design is the use of earthquake joints between different sections of the building. These joints, resembling somewhat the more familiar expansion joint, comprise double walls of reinforced concrete where each of the five sections of the structure are joined. In effect, there are five separate buildings, each permitted to sway independently under earthquake forces. To prevent seepage into these joints copper flashings are provided with slip joints as illustrated in the accompanying sketches. The use of light weight aggregate concrete for the new walls is told in an accompanying article.



V-GROOVE IN FORM SHEATHING



PLAN SHOWING LOCATION OF SLIP JOINTS

Accepting the limitations of erecting a new building over old foundations, the architects evolved a modern design balancing window areas and plane concrete surfaces. Restrained molded detail and beaded joint lines are the only decoration.

Light Weight Concrete in Bell High

By Oliver G. Bowen, Consulting Engineer

SO FAR as I know the Bell High School was the first light weight aggregate concrete job of any considerable size to be built in the Los Angeles territory. A soil investigation of this site showed the allowable bearing value to be very low. This was the primary reason for using light weight concrete.

The original building was constructed with 13-in. masonry walls in the class room buildings and 17-in. masonry walls in the auditorium. The foundations under these walls proved to be adequate to sustain 8-in. and 10-in. light weight concrete walls and the resulting pressures due to earthquake forces which had not been considered in the original design.

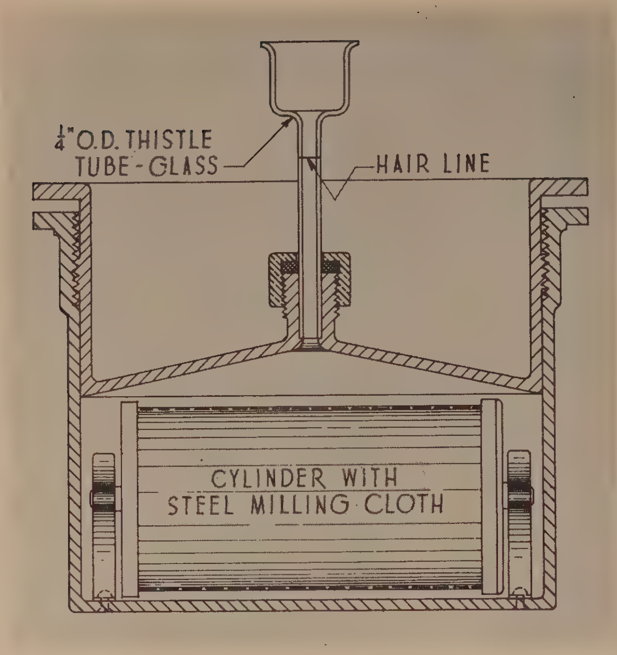
Thus in the rehabilitation of this plant the existing foundations could be left practically undisturbed and the new walls built over them. Had standard weight concrete been used, extensive underpinning would have been necessary.

The light weight aggregates used in the Bell job were manufactured from diatomaceous clay which was hauled in by truck to the plant, screened, subjected to a crude oil spray, burned and screened again through an aggregate shaker screen. The material varied considerably in porosity and specific gravity. The Bell job being the first large order executed by this company, the manufacturers had almost no physical data on which to base the design of the concrete.

Tests showed that the specific gravity varied with the particle size as did also the absorption. On account of the difficulty of measuring specific gravities with the usual equipment, a special mercury pycnometer was designed which proved very satisfactory for measuring both specific gravity and absorptions of the aggregates. Graphs of various samples were drawn showing the variation in specific gravity and absorption with particle size. The mix was designed with this information as a basis.

It was finally determined to use light weight aggregate varying from ¼-in. to ¾-in. and use a mixture of fine and coarse sand for the fine aggregate having maximum weight of 115 pounds per cu. ft.

The procedure used for designing the mix was based on the rule that the volume of concrete produced is equal to the sum of the absolute volumes of the ingredients. The absolute volume of a material is the volume of solids and is secured by dividing its weight by the product of its specific gravity and the weight of a cubic foot of water. The average specific gravity of cement is about 3.1 and that of sand is about 2.65, which were the values used.



A specially designed mercury pycnometer was used to measure specific gravity and absorption of the aggregates.

The summation of the absolute volumes of the ingredients to produce a cubic foot of concrete gives an equation involving the weight and specific gravity of each material. Substitutions are made for S and C from equations 2 and 3, producing the formidable looking but easily applied formula 1.

In the formulas the following terms appear:

Y = Yield in sacks of cement per cubic yard of concrete.

D = Weight of concrete in pounds per cubic foot.

W = Weight of mixing water in pounds per sack of cement.

G = Specific gravity light weight aggregate.

r = Absolute volume of cement divided by the absolute volume of sand. Shall not be less than .28.

S = Weight of sand in pounds per sack of cement.

C = Weight of light weight aggregate in pounds per sack of cement.

R = Absolute volume of mortar divided by absolute volume of coarse aggregate. Shall not be greater than .75.

Procedure: Given Y, D and W.

G is determined after selecting grading of coarse aggregate.

Calculate r from equation 1:

$$1.\quad r = \frac{1.286 - .486G}{\frac{.432D - 27G}{Y} + .016W\,(G\text{-}1) + .486G - 1.504}$$

Calculate S from equation 2:

$$2.\quad S = \frac{80.365}{r}$$

Calculate C from equation 3:

$$3.\quad C = \frac{27D}{Y} - (W + S + 94)$$

Calculate R from equation 4:

$$4.\quad R = \frac{G}{C}\,(.377S + W + 30.33)$$

Determine weight of water absorbed by aggregate in 30 minutes.

Add the above quantity of water to W and deduct the surface water contained in the sand. This result is the weight of water to be added to the other ingredients. Test the mix for workability and strength.

The final proportions of the mix designed by the above method were 1 part cement, 2.5 parts fine aggregate (sand) and 1.22 parts coarse light weight aggregate. This gave a concrete weighing 112 pounds per cu. ft.

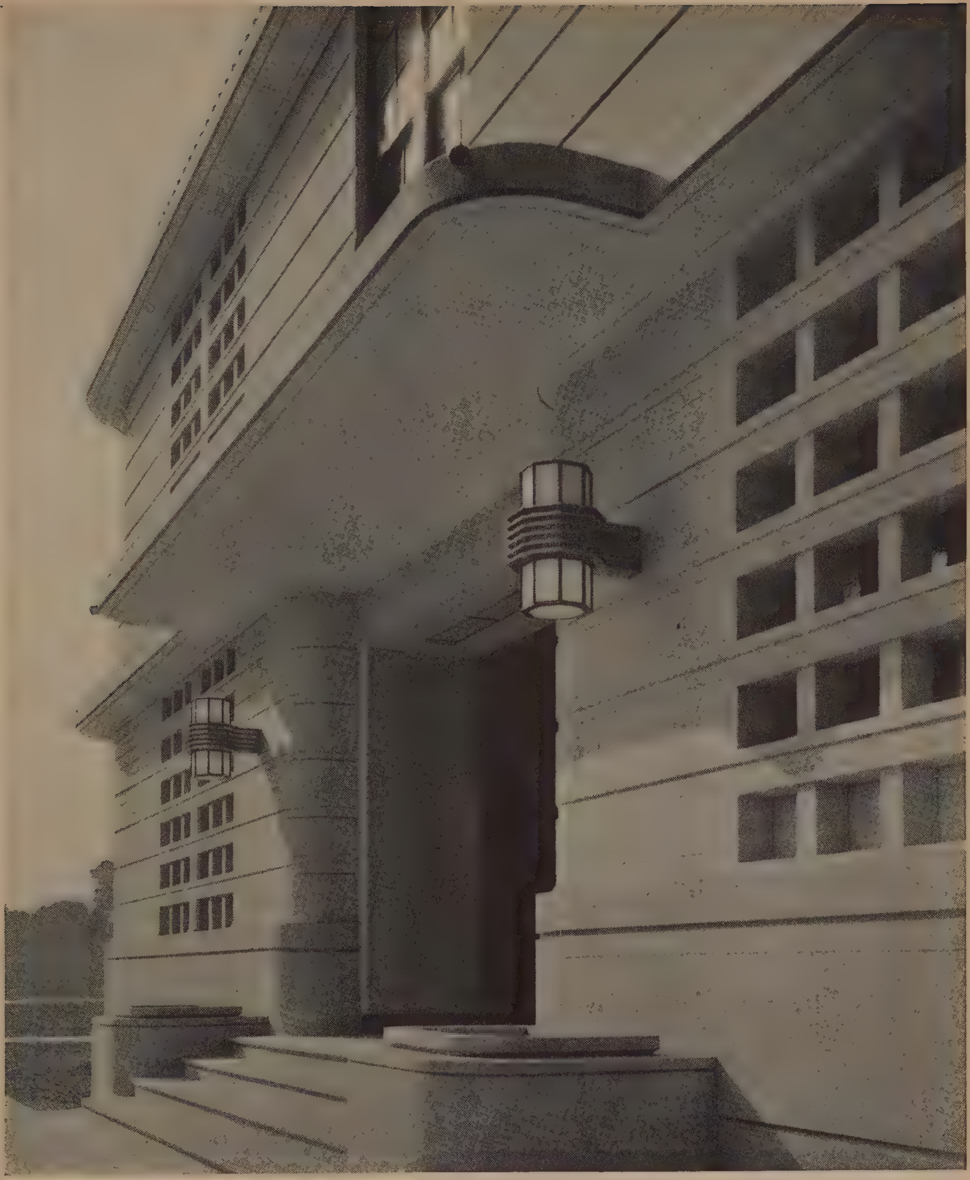
Because of the high absorption of the light weight aggregate the usual method of mixing the materials had to be changed to secure uniform results. The job procedure which was first attempted was to charge the mixer with dry aggregates. This proved to be very unsatisfactory on account of the variable slump of the resulting concrete as absorption took place for at least twenty minutes from the time the water came in contact with the aggregate. Following this another scheme was tried of putting the light weight aggregate and water in the mixer, turning it several times and then adding cement and sand. This scheme was not satisfactory because at the end of about two minutes thorough mixing had not taken place, the materials still being partially segregated.

The final scheme which was used and which proved satisfactory was to deliver the light weight aggregate dry in sacks, each sack having the same weight. These sacks were soaked with water from a hose the day before the mix was to be made and at the time of mixing the sacks were weighed on a platform scale and brought up to a uniform weight by adding more water. We endeavored to add the total amount of water to each sack which would be represented by the absorption taking place in a ten-minute immersion of the material.

The strength results obtained on the Bell job were quite consistent. We obtained only one cylinder which broke under 2000 pounds and only a very few which broke over 2300 pounds. The average result was about 2150 pounds at 28 days. Three cylinders were broken at the age of 90 days and these ran between 2900 and 3000 pounds.

Altogether I regard the work as being very satisfactory and I would use light weight aggregate again under the same circumstances.

Definitely modern is the design of new Manual Arts High School in Los Angeles. The frequently used grilles were cast in place with the Cement Gun. Parkinson and Parkinson, architects; J. G. Middleton, structural engineer; Lindgren and Swinerton, Inc., contractor.



Manual Arts High School

By Donald B. Parkinson, A.I.A.

THE SCIENCE and Administration buildings, now completed, are the first two units in the project for rebuilding Manual Arts High School in Los Angeles. Since the old structures comprising this school were to be completely replaced on the old site, the architects proposed an entirely new layout and plans for the new buildings. This was approved by the Board of Education.

Facing the designers at the outset of the work was the necessity of providing adequate accommodations for an increasing number of students in a modern, up-to-date school, yet staying within limited funds appropriated for the project. It was recognized early that a very plain and simple type of construction was desirable, and both the layout and design of the building were accordingly shaped to achieve desired results with the greatest measure of economy. The architectural treatment of the structures, therefore, was confined to modest formed detail that would give relief and interest to what might otherwise appear to be a rather severe design.

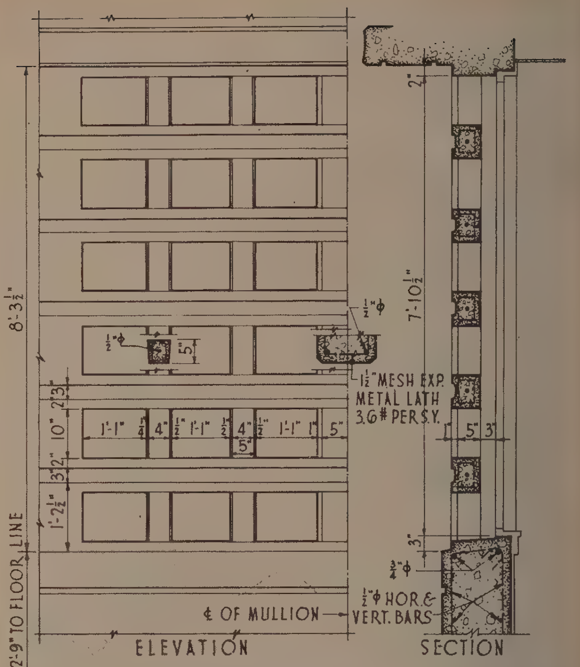
The Science building which parallels Vermont Avenue is laid out at right angles to the Administration building. Both are two-story structures of similar dimensions, the Science building 64x260 ft. and the Administration hall 64x208 ft. This consistent rectangular plan was adopted for several reasons: first, to allow maximum effective use of floor space with class rooms and laboratories ranged along either side of long corridors located through the middle of the buildings, permitting ample light from the outside; and second, to simplify structural design by permitting the repetition of typical sections. This naturally produced economies in construction.

Having no basements, the ground floors of the buildings are raised 3½ ft. above street level to accommodate service pipes and conduits. Room height in both first and second stories is 13 ft., but an air space with outside louvers for ventilation is provided under the roof by suspended ceilings dropped about 18 in. Corridors are 12½ ft. clear width and class rooms range from 23x30 to 23x40 ft. Stairways, toilets and auxiliary rooms are located in the ends of the buildings, lighted by windows back of the numerous concrete grilles.

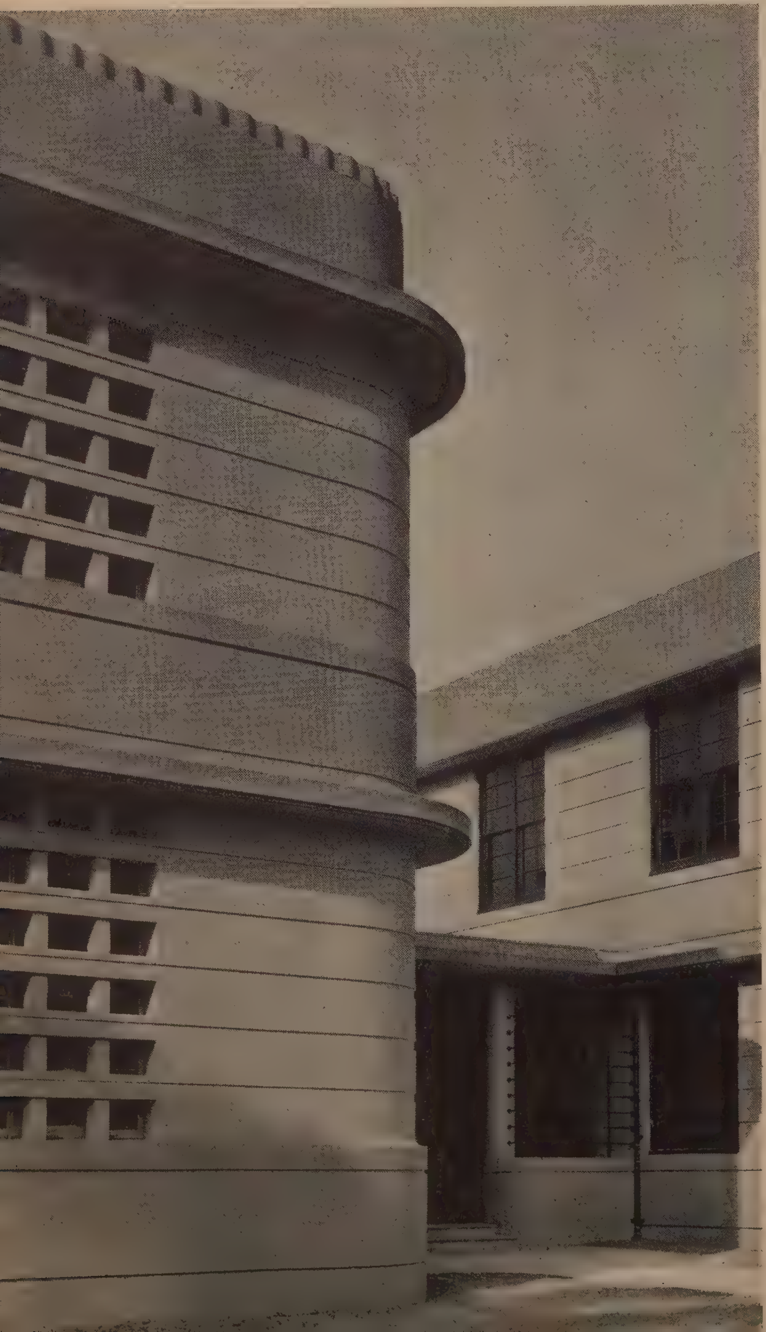
The rectangular plan and the absence of basements simplified the problem of designing for lateral forces. The general structural plan consists of a framed corridor with reinforced concrete girders and columns; concrete exterior walls treated as columns between window openings and spandrels treated as girders with diagonal reinforcing at juncture of vertical wall sections and spandrels; and reinforced concrete floor and roof slabs transmitting lateral loads to the transverse walls and the outside walls.

A pan system of floor construction was used, the 3-in. concrete floor slab strongly reinforced with steel fabric. Column and wall footings were carried down 6 ft. below the surface into well compacted sand and gravel. These footings are continuous under all transverse and bearing walls. Reinforced concrete transverse walls placed at intervals in the length of the building further stiffen the structure. The steel stairways have concrete slab treads.

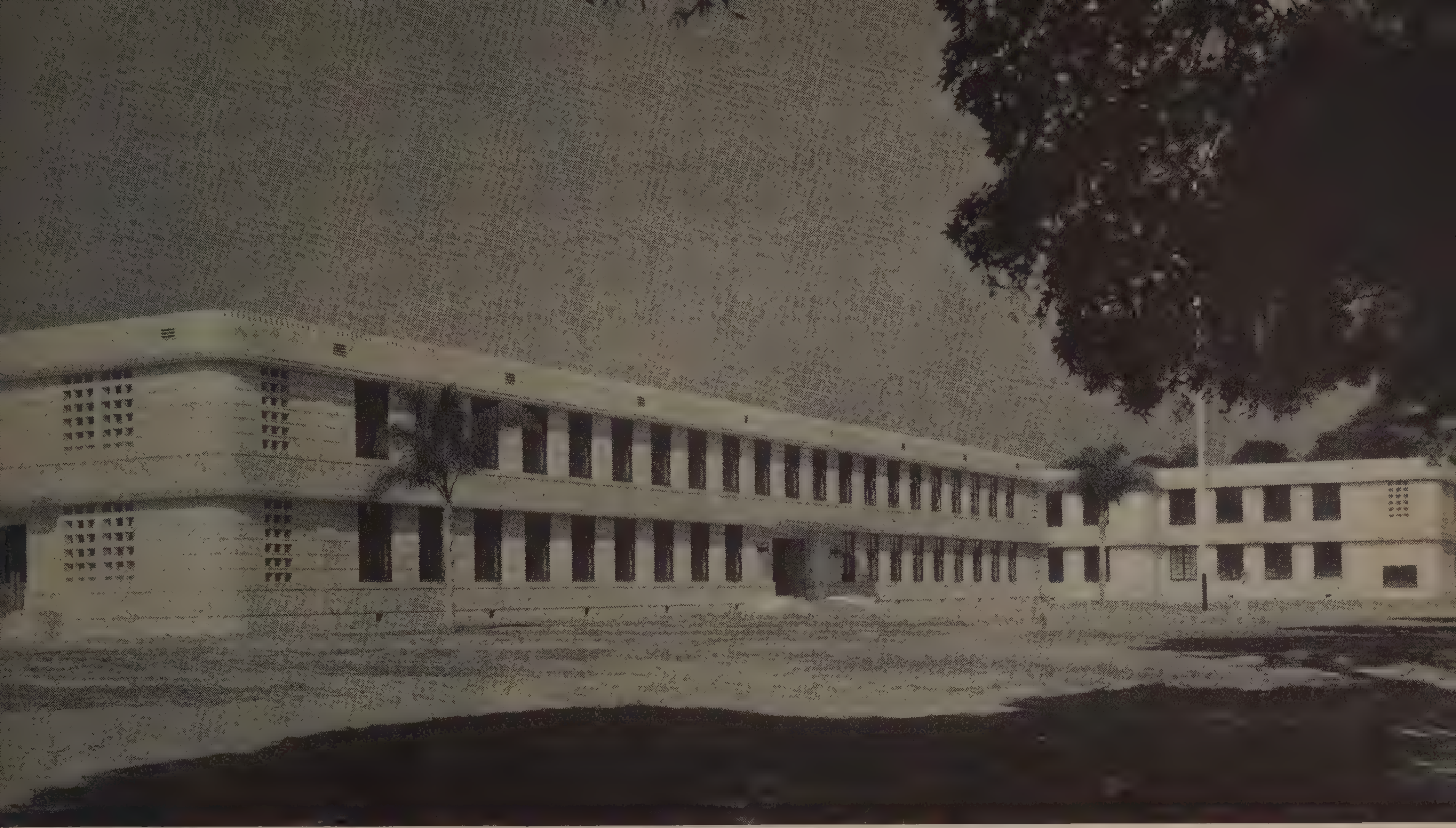
The horizontal nature of the structures is strongly emphasized in the architectural treatment by a continuous sill at the bottom of the windows, and by a continuous 18-in. slab extension at the window tops. This slab serves also to break the intense midday light. Wide rustications give a pronounced horizontal effect to the design. The concrete grilles, used generously on all facades of the buildings, were executed in an interesting manner. The outside forms were



WINDOW GRILL



The 18-in. slab extended continuously at window head level emphasizes the horizontal feeling of the design and serves as a shade against noonday sun.



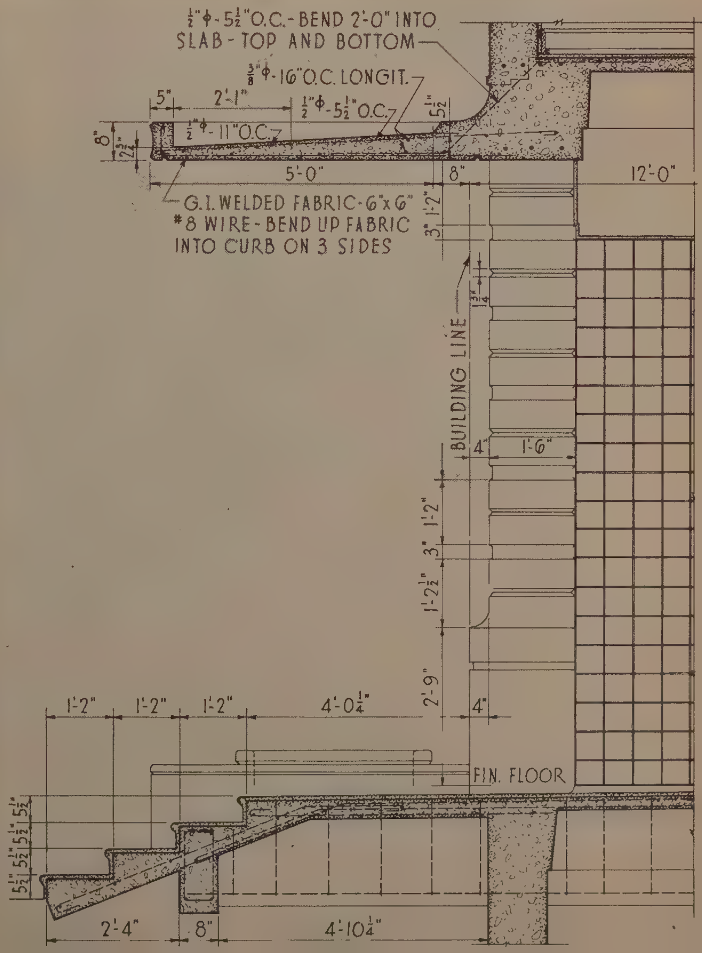
The Science and Administration buildings, similar in design and dimensions, were laid out at right angles and joined by a short covered walk. Cream and buff cement paint was used in alternate bands on the exterior.

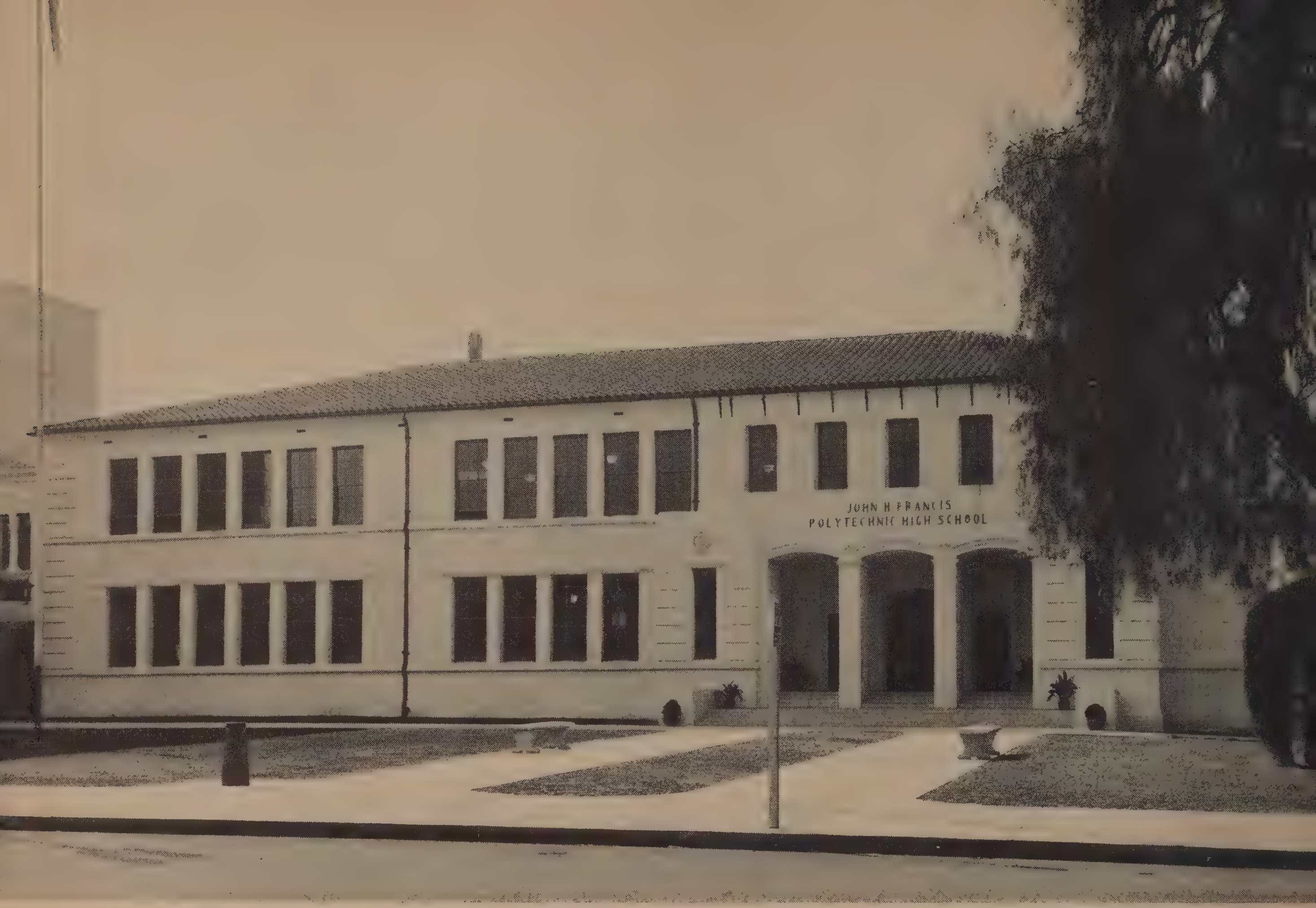
set up and concrete shot from behind them with the Cement Gun. This produced the desired form effect of an ordinary cast-in-place job.

The exterior walls have the texture of form board sheathing and are finished with cement paint in alternate bands of cream and buff. A strip of blue on the edge of the extended slab further emphasizes the horizontal feeling of the buildings. A pleasant, streamline effect results from the rounding of all corners.

Inside, the concrete floors are used without other covering. Walls are plastered and acoustical plaster is used on the ceiling, applied to metal lath which conceals the floor joists and beams. Metal lockers are set between the columns in the corridors, with metal lath and furring bringing wall surfaces flush with them. Except in the Administration building offices where hardwood is used, all trim is Oregon pine finished with paint. Windows throughout are double-hung with wood sash.

The contract price of $247,583, or $4.00 per sq. ft., covering all work on the first two units, attests to the economy of this type of construction which also, as the illustrations reveal, permits clean, sharp detail and splendid surfaces. The construction work was ably handled by Lindgren and Swinerton, Los Angeles contractors.





"Pure American" is how the architect, Albert C. Martin, designates the architecture of John H. Francis Polytechnic High School. The structure was designed to harmonize with older buildings on the grounds. Pozzo Construction Co., contractor.

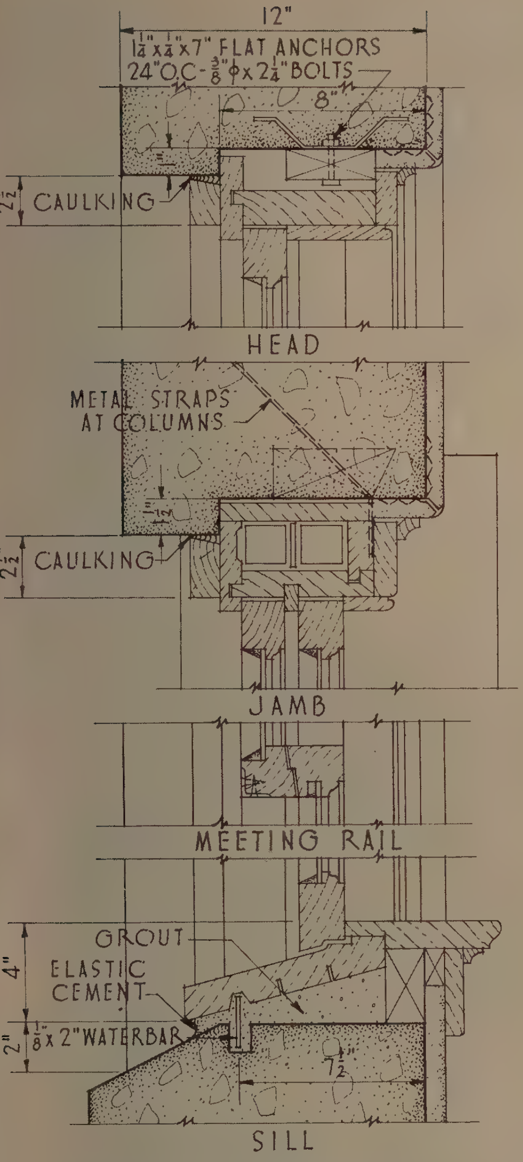
Polytechnic High School

By Albert C. Martin, A.I.A.

COMPLETION early this year of the Administration Building of the John H. Francis Polytechnic High School in Los Angeles added important space and educational facilities to the already existing plant of this school. The fact that the new unit is an addition rather than an independent structure explains its architecture.

When people ask, "What is the style of the new Polytechnic High building?" I am compelled to reply: "It is pure American architecture." And the reasons are apparent. Just to the east of this building is the school auditorium, erected several years ago—a high, definitely Spanish structure with tile roof and rather plain walls. Immediately to the back of the new building is a group of simply designed structures owning no particular architectural style. It was necessary, therefore, to plan a building that would harmonize with the previously erected structures. So, the new Administration building is not Spanish, although it reveals the influence of its tall Spanish neighbor; and it is not "Modern," although in most respects it is a very modern building. Like many another product of the "melting pot," the building is "pure American."

The primary objective in the design of this building,



TYPICAL WINDOW FRAME DETAIL
DOUBLE HUNG TYPE

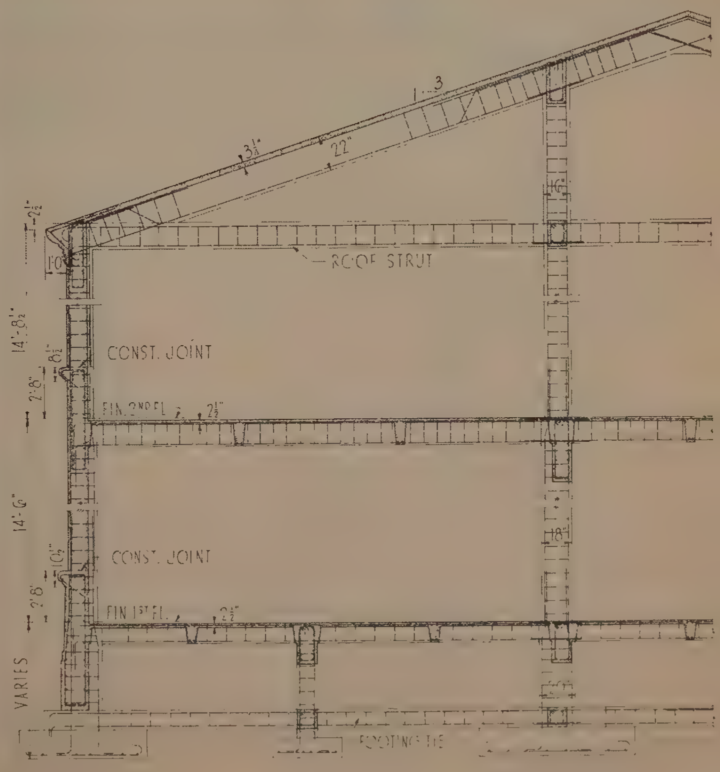
other than harmony with its surroundings, was to produce a high grade building from the structural standpoint. To this end a great deal of attention was paid to the selection of materials and equipment and to plans and specifications. The form marking patterns and general arrangement of the formwork were predetermined in the architect's office, which, incidentally, should be a customary procedure. The designer who prescribes the location of joints and any other details of formwork that affect the appearance of the structure is given comfortable assurance that the building will look the way he has visualized it when it is finished.

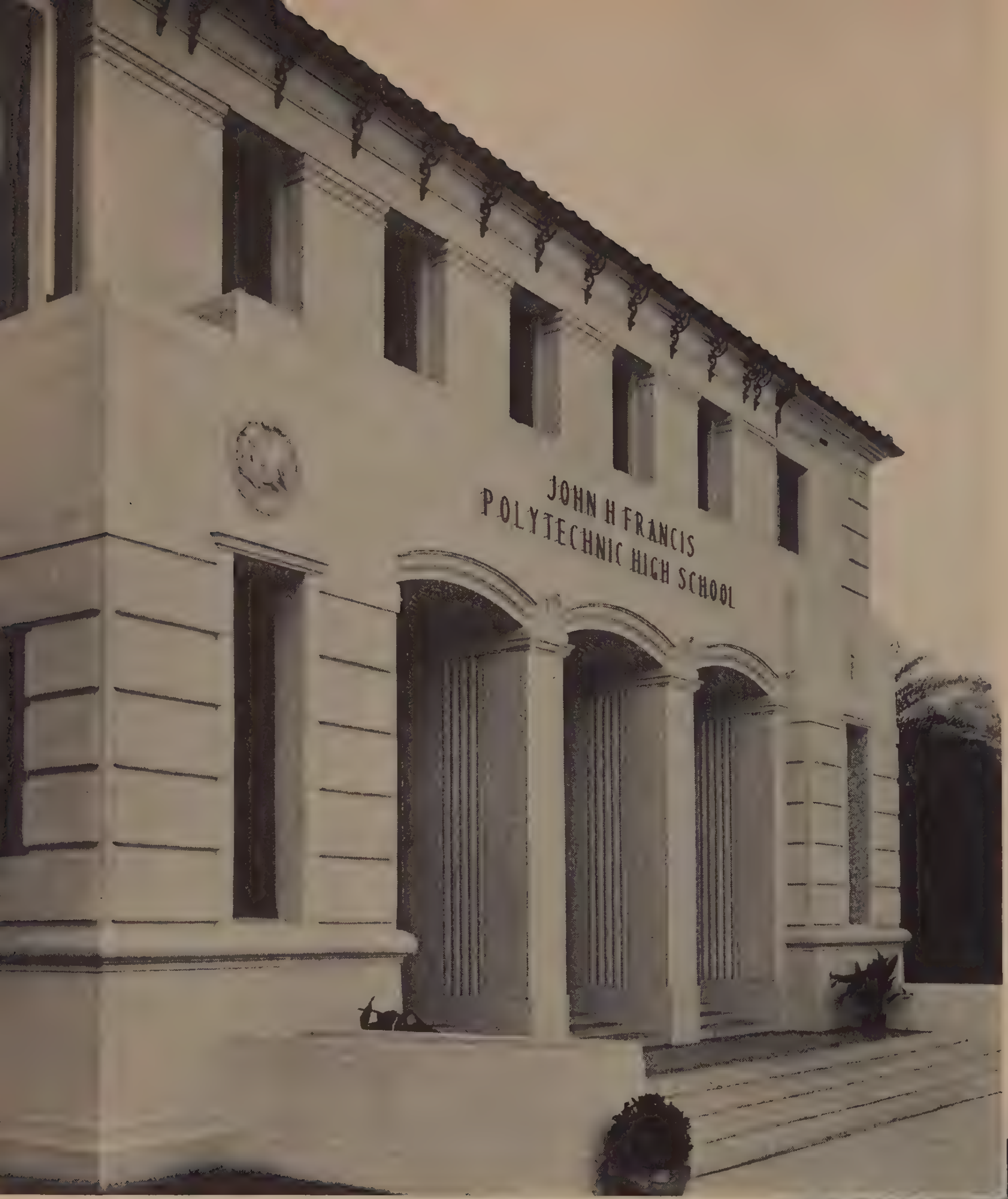
Located in Washington Boulevard opposite the intersection of Hope Street, the new building is in full view over much of the length of the latter street. Such a fortunate setting adds greatly to the architectural interest.

Primarily an administration center for the school plant, about one-fourth of the building is devoted to offices. The remainder is used for class rooms which are designed in accordance with approved educational principles.

The building has a reinforced concrete frame, enclosed by 12- and 16-in. solid concrete walls. Ribbed slabs formed with metal pans were used for floor construction and a system of beams and slabs for the pitched roof. The reinforced concrete roof framing contributes greatly to the resistance of the building against earthquakes. An accompanying sketch of a typical cross section shows the framing of the building. Foundations were placed on a coarse river gravel 7 ft. below grade and secured against independent movement by reinforced concrete ties. The structural design is in accordance with the State Architectural Department's requirements for earthquake-resistant construction. A 3-in. earthquake joint separates the new Administration unit from the auditorium structure immediately adjacent. This joint, covered with copper flashing, allows for independent movement of the two buildings.

Concrete for the walls was cast in plywood forms and internal vibration was used together with hand puddling. The maximum size of aggregate used was 1 in. Test cylinders showed the average strength of the concrete as 1,885 p.s.i. at 7 days and 2,555 p.s.i. at 28 days. Because of a



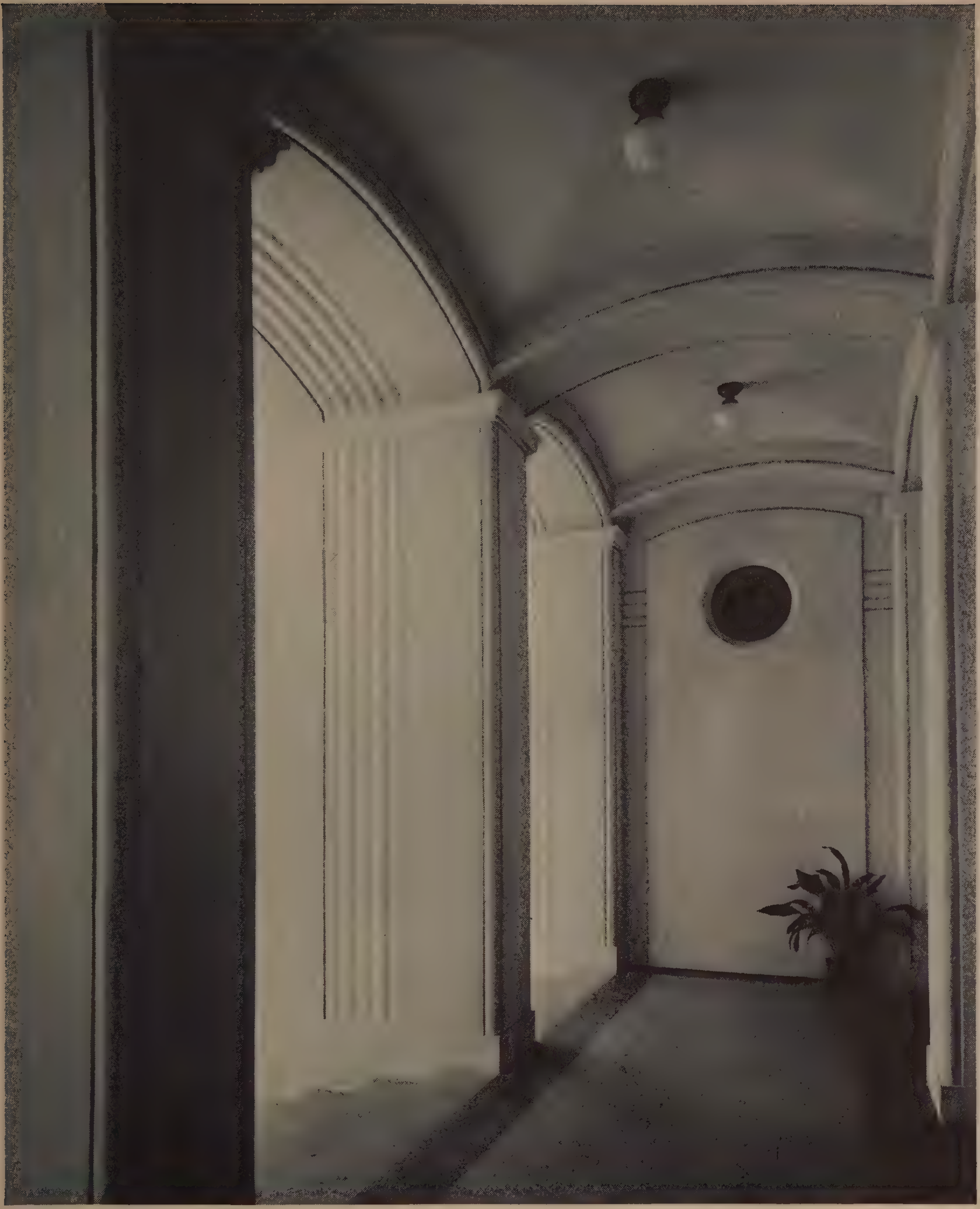


The sharp unblemished concrete surfaces (below, as they came from the forms) were finished with a coat of cement paint in a bright, light color, as shown in illustration at left.

deficiency of fines in the aggregate, a characteristic of practically all the aggregates in the vicinity of Los Angeles, an admixture was deemed necessary to improve the workability of the mix.

After stripping, all exposed surfaces were rubbed with a cement-sand grout applied with burlap to remove any slight stains and to give the concrete a uniform color. The grout is entirely rubbed off so there is no possibility of dusting or scaling. Architectural concrete is often left in the natural color after this treatment and presents a very fine appearance, but in this case cement paint was applied to produce a brilliant white exterior to harmonize with adjoining units.

An interesting construction feature is the reinforced concrete pitched roof over which is placed a tile covering of clay



Entrance porch of Polytechnic High School reveals the quality of the formwork which was consistent throughout the job.

Mission Tile. The tile are held in place by ties consisting of brass strips running at right angles to the ridge. These ties run up one side and over the ridge and down the other side. Fastened to the ties, the tiles are quite free from the concrete roof slab.

The concrete floors in the offices and class rooms have a block maple finish laid in mastic directly on the sub-floors. In the corridors the floors are exposed concrete brought to a high finish. Trim in all rooms except the administration offices, which were finished with white oak, is Douglas fir. All interior partitions were built of Z-bar studs and metal lath and plaster. Ceilings are plaster on metal lath with acoustical plaster used generally throughout the corridors.

The floor area of Polytechnic High totals 30,785 sq. ft., while the volume is 649,800 cu. ft. The total cost of $151,000 for the building breaks down into the very economical figures of $4.88 per sq. ft. and 23.4 cents per cu. ft.

Pozzo Construction Co. was the contractor and Lee Ellingwood mechanical engineer. Structural engineering design was prepared in the architect's office.

Architectural CONCRETE

ARCHITECT · ENGINEER · CONTRACTOR

IN THIS ISSUE

The architects of BOULDER DAM took their cues from the engineers (page 3) says GORDON B. KAUFMANN. . . . "What will become of the Bells of Nemours?" asks M. M. DuPONT in concluding a description (page 7) of the architecture of NEMOURS CARILLON TOWER. . . . Some TEMBLORS in 1933 were responsible for $34,000,000 worth of SCHOOL CONSTRUCTION (page 10) in Los Angeles. . . . COLOR COMES TO ARCHITECTURAL CONCRETE in the form of an A.I.A. File (pages 17 to 20) that should open up a new vista of design. . . . LIGHT WEIGHT CONCRETE has a heavyweight job in Bell High School, according to ROBERT F. TRAIN and OLIVER G. BOWEN (page 21). . . . The GRILLES of Manual Arts High School (page 25) were shot from a gun, says DONALD B. PARKINSON. . . . ALBERT C. MARTIN, giving his design formula (page 28) for Polytechnic High School, says "Spanish plus Whatucallit equals Pure American". . . . TWIN BUILDINGS, 1,000 miles apart (page 33) are engaged in a COLORFUL BUSINESS.

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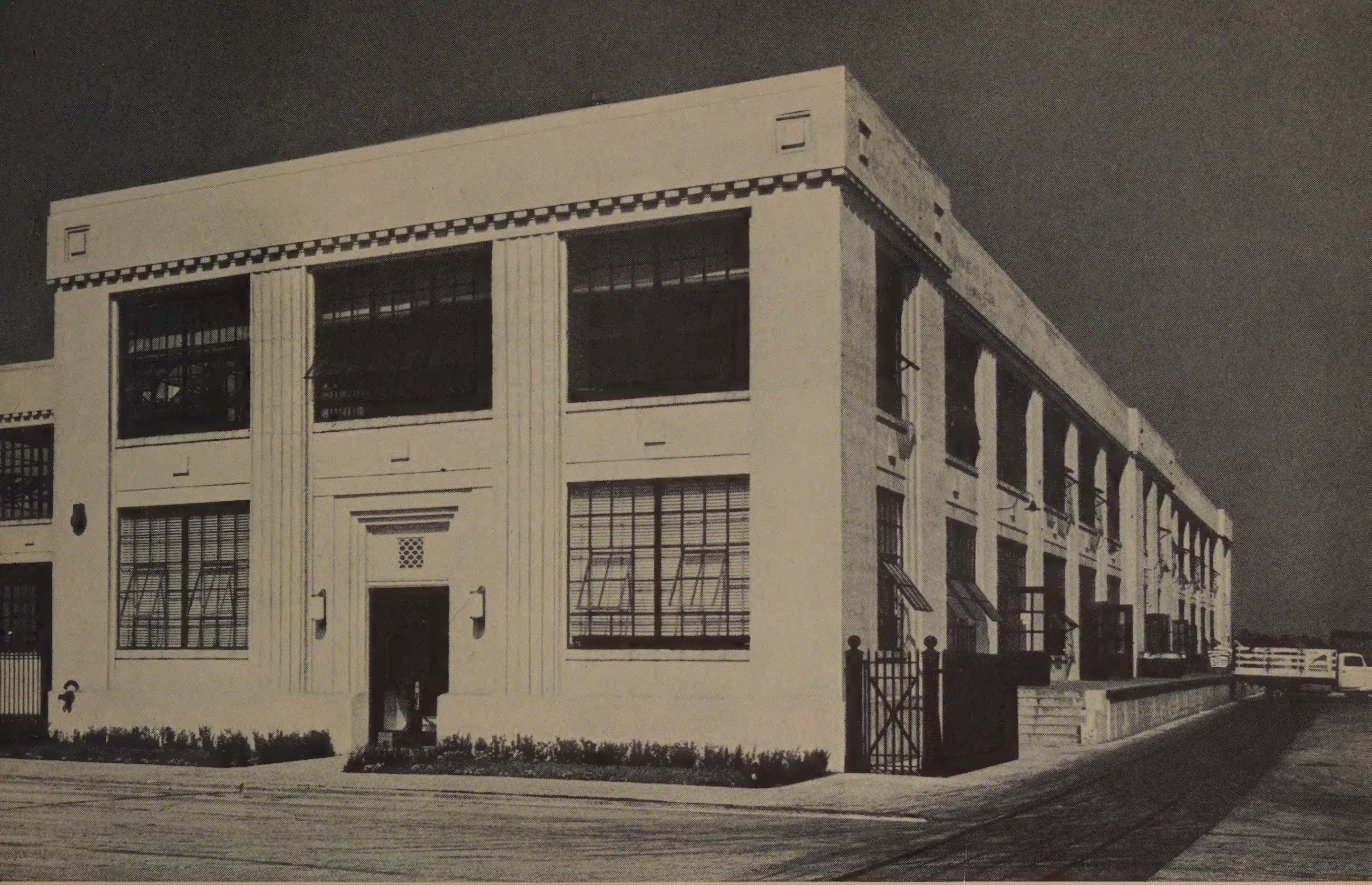
Schools Go Up

IF THE experience of the first six months is a reliable index, school construction in 1936 is destined to reach the highest total since 1930 when something short of a half billion dollars was spent. While current construction is largely financed by federal funds already committed and not likely to be augmented by new allotments, improved business and increased school revenues indicate a gradual increase of locally financed school construction.

This emergency construction has given school planning and building a stimulus that is bound to be of lasting value. It has put the spotlight on the great change that has taken place in educational planning, and it has emphasized the tremendous need for new and improved school facilities. The very presence of modern, efficiently designed buildings in contrast to unsafe, unsanitary, overcrowded and inadequate structures in almost any community will result in new plans and new buildings the minute money is available in school board treasuries.

That this great urge for new facilities can be directed into unwise policies, however, is evident from some proposals that new construction be of cheap and impermanent design. Attempting to justify their short-sighted plans by the need for "flexibility and mobility," they propose short-lived structures that could be abandoned in 10 years to meet changing educational ideals and avoid obsolescence. The schools they envision would be no more than the portable, knockdown structures that the current building program is attempting to replace with solid, durable, firesafe buildings. To sacrifice safety, health and investment security for the sake of continual novelty is lazy, extravagant planning. There would never be, in the most opulent times, enough money to proceed on such a program.

Properly planned, permanent construction need never become obsolete. Current needs can be provided for and future requirements anticipated. That is what school planning means. Expansion can be taken care of by adding self-contained units of the same durable construction, when needed. Protection of children, provision for their health and comfort, and security of investment are only possible in permanent construction. No amount of fancy, claptrap construction can ever be justified on the grounds of avoiding obsolescence.



One of two practically identical concrete structures erected for International Printing Ink Corporation is this one at Chicago. Designed by International Printing Ink Corporation, New York; The Austin Company, contractor. The other building is at Lodi, N. J.

I. P. I. Erects Two New Buildings

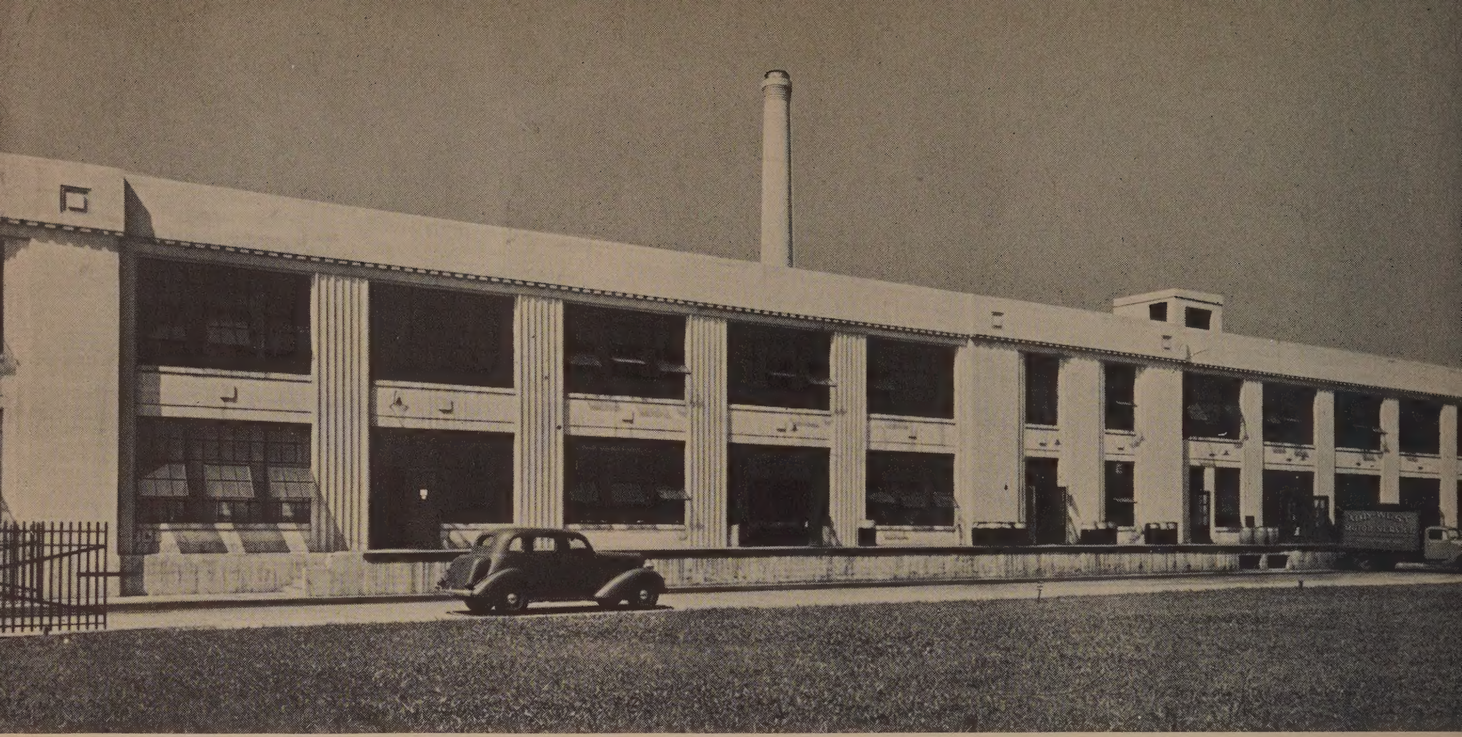
IN ORDER to be fully prepared—from the standpoint ot necessary manufacturing facilities—to meet the anticipated increase in business due to improved conditions, In-Tag Company, a subsidiary of the International Printing Ink Corporation, of New York City, has recently completed construction of two buildings. These are located at New Street, Lodi, N. J., and at 51st and Whipple Streets, Chicago. The buildings are constructed with steel frames, reinforced concrete floors and architectural concrete exterior walls. In design and construction they are practically identical structures.

Objectives sought in the design of the buildings were to obtain the most practical arrangement of space—manufacturing processes being duly considered—to provide structures of such a type as to reduce the explosion hazard to a minimum; to achieve ease of future extension; and to create a dignified and pleasing architectural form entirely consistent with the strictly utilitarian character of the structures.

The buildings are two story and partial basement, U-shaped in plan, and comprise three distinct units. The shipping and storage divisions are located in the rectangular front portion of the building which is approximately 227x47 ft. The two manufacturing sections occupy the wings and consist of mill rooms on the first floor and storage rooms on the second floor, each about 77x52 ft. A section at the left of the main unit comprises toilet, shower and locker rooms on the first floor and offices and laboratory on the second floor.

Due to poor foundation conditions at Lodi, it was necessary to use concrete piles. This was practically the only major difference in the Lodi and Chicago jobs.

The concrete mix for all parts of the work was 1:6, the proportions of fine and coarse aggregates being adjusted as



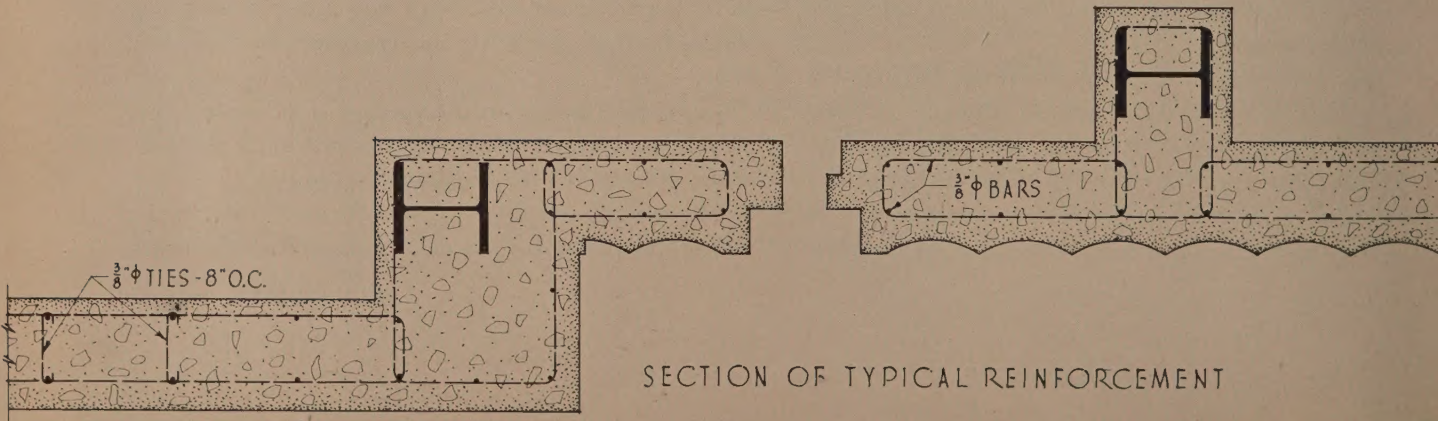
The loading platform is located along the rectangular portion of the structure. Fluted columns separate wide windows. The only other important decorative detail is a dentil band above the second-story windows.

a result of laboratory tests with the job aggregates to provide a thoroughly plastic mix with a water-cement ratio not to exceed 6½ gal. per sack of cement. The maximum slump allowed was 5 in. Frequent tests of the concrete as it was placed in the job were made to assure uniform quality. White portland cement was used in the Chicago building, and standard grey portland cement in the Lodi plant. Work commenced at Lodi on March 6, 1935 and at Chicago on April 18, 1935. Both structures were substantially completed by November of the same year.

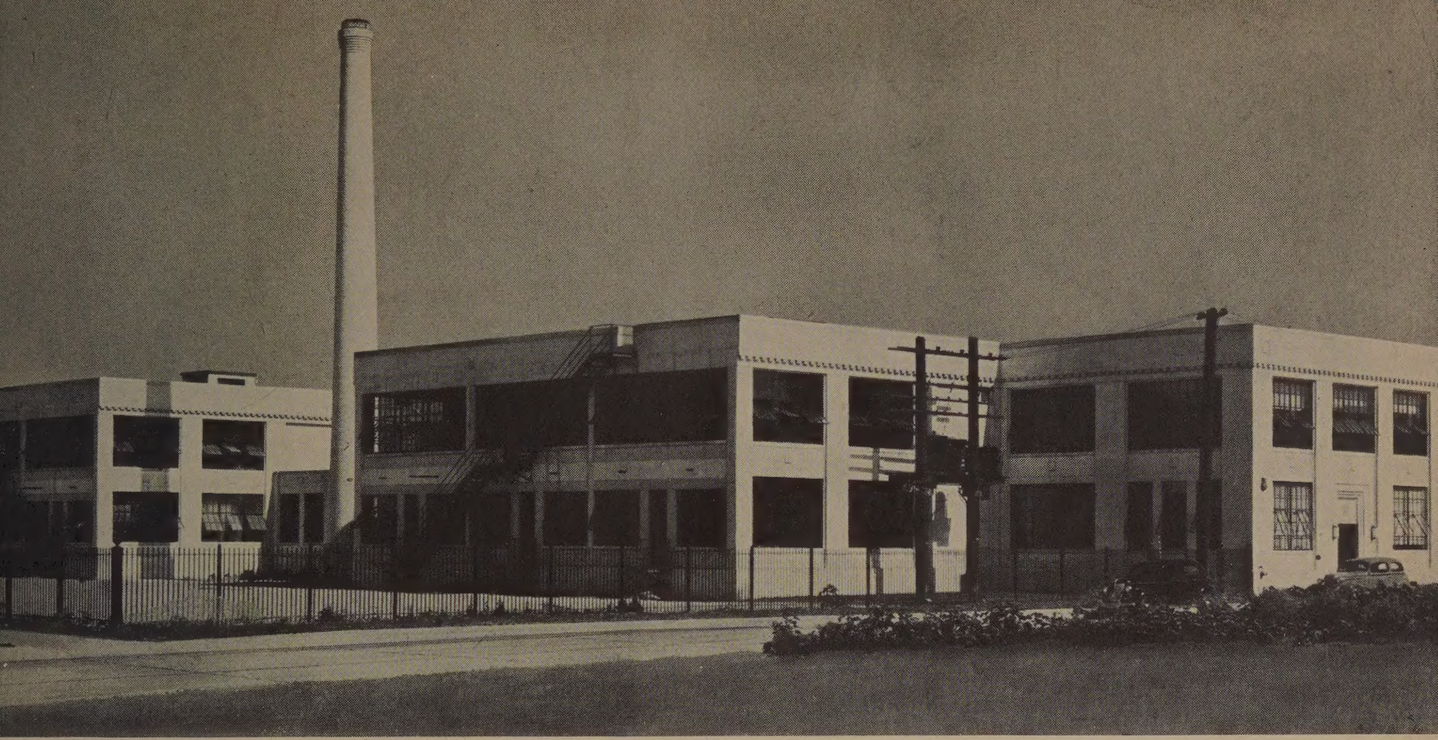
The architectural concrete exterior wall construction was determined upon only after a very careful analysis had been made of the comparative cost of walls built of brick, cut stone with common brick backup, and of architectural concrete. The unit costs compiled from this analysis showed a very substantial saving in favor of concrete.

The main or south elevation of the buildings is broken at each end and at the center by projecting bays. These express the location of the stair towers in the plan and provide, at the same time, accents in the relatively long facade which might otherwise have appeared rather monotonous.

Upon making the decision to use architectural concrete a careful study of existing concrete structures was made since it was felt that, in general, architects have not taken full advantage of the possibilities of achieving good design in buildings constructed of this material. A modified classical design was developed in which the fluted piers carry a continuous horizontal spandrel and parapet wall, relieved by a dentil band immediately above the second story windows. Piers of uniform width were adopted, their width being determined, in part, by the fenestration. Standard units were used for windows. Spandrels over the first-story



SECTION OF TYPICAL REINFORCEMENT



At the rear of the IPI building are two wings in which are located the manufacturing sections of the plant. The walls of the Chicago structure were made of white portland cement concrete.

windows, 8 in. in thickness, were placed separately from the floor slabs at that level. Horizontal construction joints were located at the top of the first-story spandrels, and at the heads of the second-story windows.

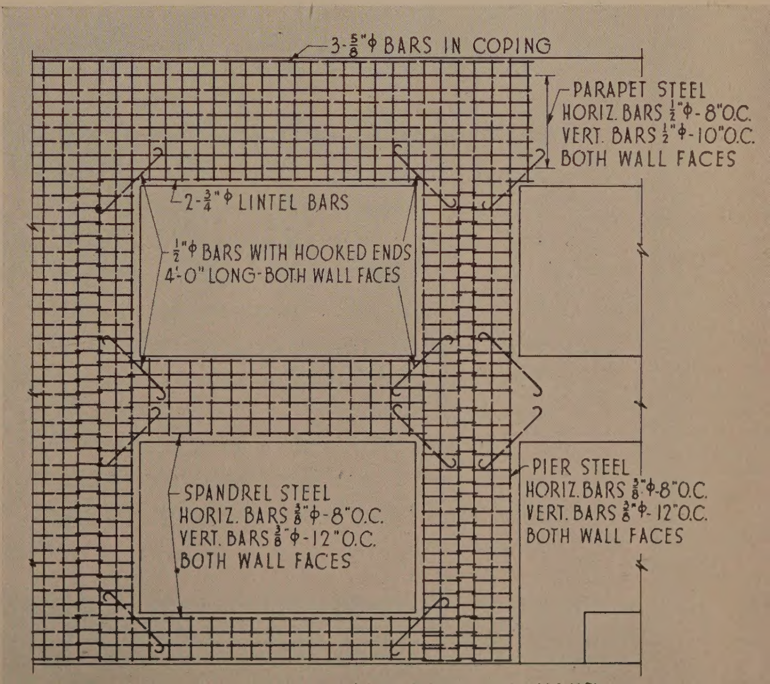
Adequate reinforcement of architectural concrete walls is very important and it is particularly desirable to use a elatively close spacing of small bars rather than larger bars spaced far apart. Two curtains of ⅜-in. round bars were used as the main wall reinforcement in both jobs. The spacing of bars is shown in an accompanying illustration. Because of more severe exposure the parapet wall reinforcement was increased to ½-in. round bars horizontally at 8-in. and ½-in. round bars vertically on 10-in. centers. Additional ½-in. rounds with hooked ends were placed diagonally across window corners in each face of the wall.

Expansion joints were provided at either side of the center motif on the south elevation in order to minimize the possibility of cracking due to volume changes. Careful consideration was given to the possible need for additional expansion joints at other points but it was decided a closer spacing was unnecessary.

A precast concrete false grille lends an interesting note to the entrance of the Chicago building. Depth is given to the entrance by a series of reveals of diminishing widths.

Both buildings were designed for possible future expansion to the north of the manufacturing wings. Curtain walls of these wings are constructed of brick and steel sash, care being taken to so design the columns and piers that when the temporary wall is removed and the wings extended, extensive structural changes will be unnecessary.

In detailing the steel sash installation, it was thought advisable to avoid the standard method of permanently fixing the sash to the concrete. Steel sash fixed in a boxed groove cannot be removed without considerable expense. The details used in these buildings afford firm anchorage, at the same time permitting easy removal of the entire sash for painting or repair.



BEAUTIFUL WALLS OF CONCRETE are contributing to a new school architecture

Lafayette Junior High School, Los Angeles, California, Parkinson & Parkinson, Architects, J. G. Middleton, Structural Engineer. Theodore A. Beyer Corporation, Contractor.

EXTERIOR walls of recent concrete schools like this mean welcome economy. They're cast integral with the rest of the structure in one economical material.

They assure years of service with very little maintenance—as proved by experience with older concrete schools in every climate. They afford protection against fire, storm and earthquake.

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